To the . . .
Deans of the Agricultural Divisions,
Heads of the Animal Husbandry Departments,
Representatives of the Meat Sections
of our Agricultural Colleges

• • • • • • • • • • • • • • • • • • •

PROCEEDINGS

Fifth Annual
Reciprocal Meat Conference

Chicago, Illinois — June 10, 11, 12, 1952

PARTICIPANTS

79 Representatives from Agricultural Colleges and the United States Department of Agriculture.

• • • • • • • • • • • • • • • • • • •

NATIONAL LIVE STOCK AND MEAT BOARD
[illegible] South Dearborn Street
Chicago 5, Illinois

CFTRI-MYSORE
8442
5th annual recip...

PREFACE

The program for the Fifth Annual Reciprocal Meat Conference consisted of the presentation and discussion of subjects pertinent to the advancement of meats work in our universities and colleges throughout the United States and Canada. This program is the result of the combined efforts of the various appointed committees, the executive committee and the National Live Stock and Meat Board.

The 1952 Conference brought into final form the results of the discussions centered about the initial committee reports presented in 1951. Each committee has made definite recommendations regarding the most desirable techniques and methods to use in meat research, teaching and extension. Following discussion the conference took action on each report either in the form of acceptance or rejection. This material can now serve as a guide to all doing work in the meats or related fields.

In addition to the two day conference, program arrangements were made for a Meat Grading Clinic to be conducted in a Chicago meat packing plant. In addition to grading beef and lamb, pork was graded by conference representatives and discussed by official graders from the Production and Marketing Administration of the United States Department of Agriculture.

The discussions and papers presented at the conference will provide up-to-date information both for the teacher and the researcher. This information is being made available to agricultural colleges and university men working in the field of meats.

R. W. Bray,
Conference Chairman

Executive and Program Committee:
R. W. Bray, Chairman
C. H. Adams
L. J. Bratzler
L. E. Kunkle
P. Thos. Ziegler

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE * MYSORE
8442
LIBRARY
25/2/69

F8,3Z0"p
N52

CFTRI-MYSORE
8442
5th annual recip..

PARTICIPANTS

5TH ANNUAL RECIPROCAL MEAT CONFERENCE

Those participating included 79 representatives from 36 agricultural colleges of the United States and Canada and the U. S. Department of Agriculture.

ARKANSAS
M. C. Heck
University of Arkansas
Fayetteville, Arkansas

H. G. Ford
University of Arkansas
Fayetteville, Arkansas

CALIFORNIA
F. D. Carroll
University of California
Davis, California

COLORADO
M. H. Hazaleus
Colorado A. & M. College
Fort Collins, Colorado

FLORIDA
A. M. Pearson
University of Florida
Gainesville, Florida

Donald Kropf
University of Florida
Gainesville, Florida

IDAHO
W. P. Lehrer, Jr.
University of Idaho
Moscow, Idaho

ILLINOIS
Sleeter Bull
University of Illinois
Urbana, Illinois

B. Breidenstein
University of Illinois
Urbana, Illinois

James R. Stouffer
University of Illinois
Urbana, Illinois

INDIANA
J. E. Young
Purdue University
Lafayette, Indiana

IOWA
E. A. Kline
Iowa State College
Ames, Iowa

E. S. Clifton
Iowa State College
Ames, Iowa

J. Kastelic
Iowa State College
Ames, Iowa

R. G. Tischer
Iowa State College
Ames, Iowa

KANSAS
D. L. Mackintosh
Kansas State College
Manhattan, Kansas

J. L. Hall
Kansas State College
Manhattan, Kansas

R. P. Soule, Jr.
Kansas State College
Manhattan, Kansas

KENTUCKY
J. D. Kemp
University of Kentucky
Lexington, Kentucky

LOUISIANA
J. B. Francioni, Jr.
Louisiana State University
Baton Rouge, Louisiana

Paul Brown
Louisiana State University
Baton Rouge, Louisiana

MARYLAND
M. H. Kerr
University of Maryland
College Park, Maryland

MASSACHUSETTS
N. S. Hale
University of Massachusetts
Amherst, Massachusetts

MICHIGAN
L. J. Bratzler
Michigan State College
East Lansing, Michigan

M. M. Voegeli
Michigan State College
East Lansing, Michigan

R. J. Deans
Michigan State College
East Lansing, Michigan

R. E. Rust
Michigan State College
East Lansing, Michigan

J. H. Gallaway
Michigan State College
East Lansing, Michigan

MINNESOTA
P. A. Anderson
University of Minnesota
St. Paul, Minnesota

W. J. Aunan
University of Minnesota
St. Paul, Minnesota

MISSISSIPPI
W. L. Richmond
Mississippi State College
State College, Mississippi

MISSOURI
D. E. Brady
University of Missouri
Columbia, Missouri

Miss L. N. Tucker
University of Missouri
Columbia, Missouri

R. L. Henrickson
University of Missouri
Columbia, Missouri

H. D. Naumann
University of Missouri
Columbia, Missouri

Leonard Kamm
University of Missouri
Columbia, Missouri

NEBRASKA
Wm. J. Loeffel
University of Nebraska
Lincoln, Nebraska

C. H. Adams
University of Nebraska
Lincoln, Nebraska

NEVADA
James F. Kidwell
University of Nevada
Reno, Nevada

NEW JERSEY
G. W. Vander Noot
Rutgers University
New Brunswick, New Jersey

NEW YORK
J. I. Miller
Cornell University
Ithaca, New York

J. J. Wanderstock
Cornell University
Ithaca, New York

G. H. Wellington
Cornell University
Ithaca, New York

NORTH CAROLINA
T. N. Blumer
No. Carolina State College
Raleigh, North Carolina

W. L. Brown
No. Carolina State College
Raleigh, North Carolina

OHIO
F. E. Deatherage
Ohio State University
Columbus, Ohio

L. E. Kunkle
Ohio State University
Columbus, Ohio

V. R. Cahill
Ohio State University
Columbus, Ohio

E. J. Briskey
Ohio State University
Columbus, Ohio

OKLAHOMA
J. C. Hillier
Oklahoma A. & M. College
Stillwater, Oklahoma

L. E. Walters
Oklahoma A. & M. College
Stillwater, Oklahoma

ONTARIO, CANADA
E. C. Stillwell
Ont. Agricultural College
Guelph, Ontario, Canada

OREGON
A. W. Oliver
Oregon State College
Corvallis, Oregon

PENNSYLVANIA
Dean Lyman E. Jackson
Pennsylvania State College
State College, Pennsylvania

P. Thos. Ziegler
Pennsylvania State College
State College, Pennsylvania

James Christian
Pennsylvania State College
State College, Pennsylvania

SOUTH CAROLINA
R. F. Wheeler
Clemson Agricultural College
Clemson, South Carolina

SOUTH DAKOTA
E. A. Pierce
South Dakota State College
Brookings, South Dakota

General T. King
South Dakota State College
Brookings, South Dakota

TENNESSEE
J. W. Cole
University of Tennessee
Knoxville, Tennessee

TEXAS
O. D. Butler, Jr.
Texas A. & M. College
College Station, Texas

VIRGINIA
R. A. Edgar
Virginia Polytechnic Ins.
Blacksburg, Virginia

WASHINGTON
T. O. Meyer
State College of Wash.
Pullman, Washington

WEST VIRGINIA
V. K. Johnson
West Virginia University
Morgantown, West Virginia

WISCONSIN
R. W. Bray
University of Wisconsin
Madison, Wisconsin

D. H. Williams
University of Wisconsin
Madison, Wisconsin

G. D. Wilson
University of Wisconsin
Madison, Wisconsin

Bernard Haasl
University of Wisconsin
Madison, Wisconsin

Robert Kelly
University of Wisconsin
Madison, Wisconsin

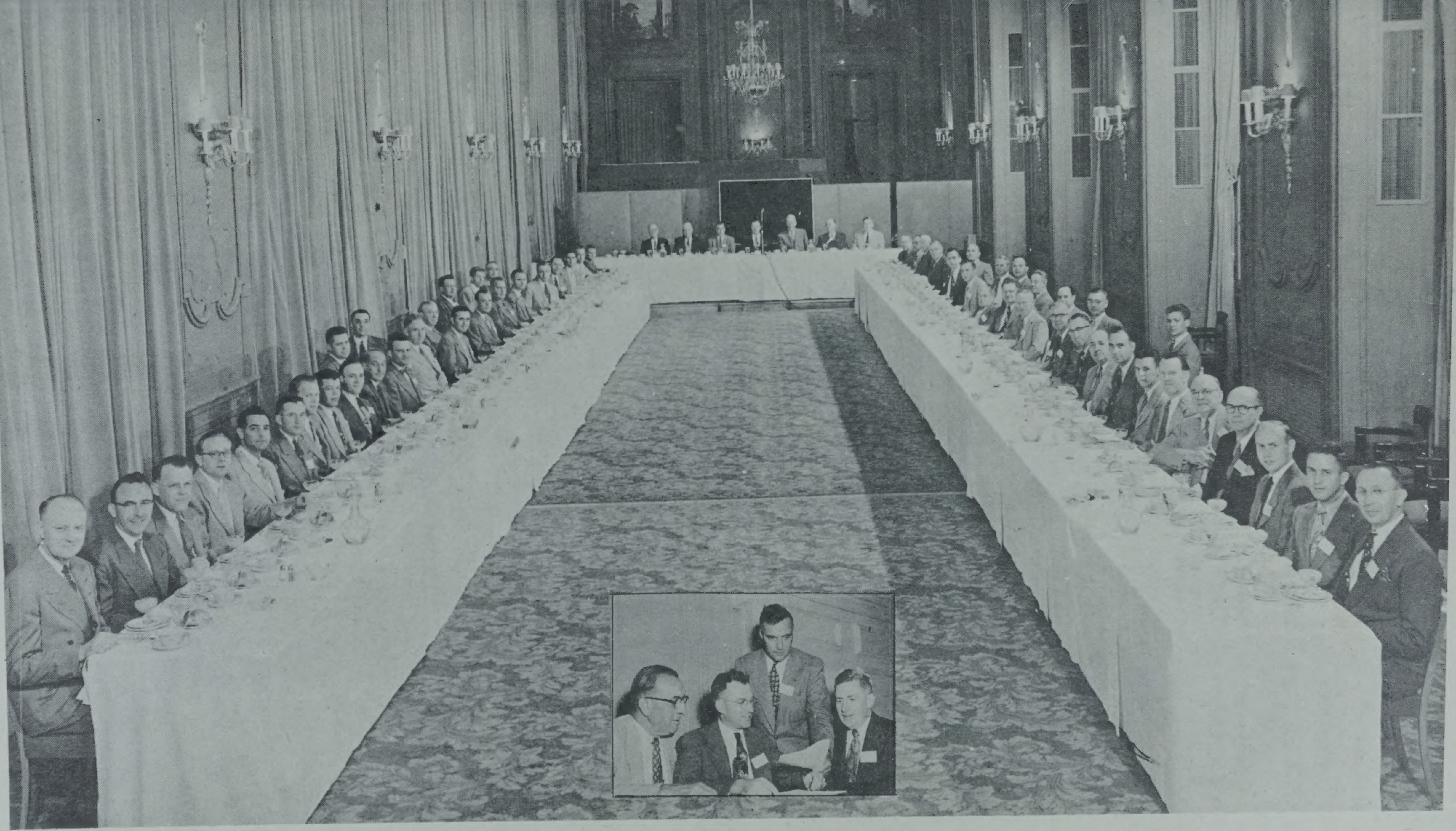
Robert Merkel
University of Wisconsin
Madison, Wisconsin

WYOMING
E. P. Margerum, Jr.
University of Wyoming
Laramie, Wyoming

WASHINGTON, D. C.
United States Department of Agriculture
O. G. Hankins
W. L. Sulzbacher
R. G. Schott
R. L. Hiner
Bureau of Animal Industry

K. F. Warner
Extension Service

F. J. Beard
C. E. Murphey
C. L. Strong
Standardization & Grading Division



IN ATTENDANCE - FIFTH ANNUAL RECIPROCAL MEAT CONFERENCE

At the speaker's table: Dean H. H. Kildee, Iowa State College; Dean Lyman E. Jackson, Pennsylvania State College; R. W. Bray, University of Wisconsin; Jay Taylor, chairman, National Live Stock and Meat Board; R. C. Pollock, general manager, National Live Stock and Meat Board; Wesley Hardenbergh, president, American Meat Institute; L. E. Kunkle, Ohio State University.

INSET PICTURE - The 1952 Executive Committee. (Left to right) P. T. Ziegler, Pennsylvania State College; C. H. Adams, University of Nebraska; R. W. Bray, University of Wisconsin, chairman;

PROGRAM

of

FIFTH ANNUAL RECIPROCAL MEAT CONFERENCE

JUNE 10, 11, & 12, 1952
CONRAD HILTON HOTEL, PRIVATE DINING ROOM 2, THIRD FLOOR
CHICAGO, ILLINOIS

PAGE

Tuesday Morning Session
June 10, 1952

Remarks - Mr. Pollock 2

TEACHING COMMITTEE - V. R. Cahill, Chairman
Ohio State University 4

Manufacture and Maintenance of Packing House Cutlery
J. D. Gallery
Russell Harrington Cutlery Co. 5

Comments Re: Syllabus of a Basic Meats Course
Sleeter Bull
University of Illinois 15

Principles of Preservation and Curing
W. L. Brown
North Carolina State College 16

Retail Merchandising
V. R. Cahill
Ohio State University 18

Instructing a Meat Laboratory Course with Reference to Retail Cutting and Freezer Packaging
R. P. Soule, Jr.
Kansas State College 21

Adjournment 24

Tuesday Afternoon Session
June 10, 1952

MEAT JUDGING MANUAL AND CONTEST COMMITTEE -
J. C. Hillier, Chairman
Oklahoma A. & M. College 26

Classification and Grading of Meats
J. C. Pierce
U. S. Department of Agriculture 28

PAGE

RESEARCH REVIEW COMMITTEE - J. J. Wanderstock, Chairman
Cornell University 49

Adjournment 54

Tuesday Evening Session
June 10, 1952

EXTENSION COMMITTEE - R. W. Snyder, Chairman
Texas A. & M. College 55

Meat Animal Production for the Consumer
D. H. Williams
University of Wisconsin 57

Purdue Meat Merchandising Program
J. E. Young
Purdue University 60

Arkansas Extension Service
Howard G. Ford, Extension Meats Specialist
Little Rock, Arkansas 66

A Digest of Suggestions to Consider in Planning and Putting into Action an Extension Service Meat Program
J. B. Francioni, Jr.
Louisiana State University and
A. and M. College 69

Work Plan for an Extension Meats Program
W. L. Richmond
Mississippi State College 72

Meats Extension in New York State
G. H. Wellington
Cornell University 75

Wednesday Morning Session
June 11, 1952

LAMB CARCASS EVALUATION COMMITTEE - G. W. Vander Noot, Chairman
Rutgers University 80

Fifth Annual Reciprocal Meats Conference
E. P. Margerum
University of Wyoming 81

Method of Cutting Lamb Carcasses
J. D. Kemp
University of Kentucky 89

PAGE

Measurements of Lamb Carcasses - Recommendations for some Procedures on Lamb and Mutton Projects
A. W. Oliver
Oregon State College 91

BEEF CARCASS EVALUATION COMMITTEE - D. L. Mackintosh, Chairman
Kansas State College 96

An Outline of Suggestions on Slaughter of the Beef Carcass Evaluation Committee
R. J. Deans
University of Michigan 97

Outline of Desirable Chemical and Organoleptic Tests and Certain Physical Measurements that could be made on Carcass Beef
C. H. Adams
University of Nebraska 103

A Recommended Procedure for Measuring and Grading Beef for Carcass Evaluation
H. D. Naumann
University of Missouri 108

Some Beef Carcass Measurements as Related to Grade
E. S. Clifton
Iowa State College 113

PORK CARCASS EVALUATION COMMITTEE - J. W. Cole, Chairman
University of Tennessee 118

Introduction 118

Report of the Pork Carcass Evaluation Committee 119

Standard Methods of Measuring and Grading for Pork Carcass Evaluation 123

Adjournment 141

Wednesday Afternoon Session
June 11, 1952

RESEARCH METHODS COMMITTEE - O. G. Hankins, Chairman
B.A.I., U.S.D.A. 142

Experimental Designs - Pertaining to Meat Projects
Ralph G. Schott
United States Department of Agriculture 144

Physical Research Methods
D. E. Brady
University of Missouri 148

PAGE

Adventures in Testing Meat for Tenderness
K. F. Warner
Extension Meat Specialist
B.A.I., U.S.D.A. 156

Chemical Methods - Their Use in Meats Research
A. M. Pearson
University of Florida 161

Discussion of Chemical Methods
J. L. Hall
Kansas State College 165

Report of Subcommittee on Microbiological Methods of Meat Research
William L. Sulzbacher
United States Department of Agriculture 170

The Chemistry of Fresh Meat and Its Relation to Tenderness and Other Palatability Factors
F. E. Deatherage
Ohio State University 177

Business Meeting 188

Committees for Sixth Reciprocal Meat Conference - 1953 193

Adjournment 196

Thursday Morning
June 12, 1952

Beef and Lamb Carcass Grading Clinic
Wilson and Co., Inc. 197

TUESDAY MORNING SESSION

JUNE 10, 1952

The opening session of the Fifth Annual Reciprocal Meat Conference, held at the Conrad Hilton Hotel, Chicago, Illinois, June 10-12, 1952, convened at 10:00 o'clock, Tuesday morning, June 10, 1952, Mr. R. W. Bray, Wisconsin, presiding.

CHAIRMAN R. W. BRAY: In opening this Fifth Annual Reciprocal Meat Conference, it is entirely in order that we have a few remarks of welcome from the secretary-general manager of the National Live Stock and Meat Board, Mr. R. C. Pollock. As you know, Mr. Pollock has been instrumental in getting this conference under way. Without the aid we receive from him and his organization I am sure that these conferences would be next to impossible. We have greatly appreciated the help that he has given us during the past five years. At this time I would like to present to the Conference Mr. Pollock.

REMARKS BY MR. POLLOCK AT OPENING OF 5th ANNUAL RECIPROCAL MEAT CONFERENCE, TUESDAY MORNING, JUNE 10, 1952

I want all of you men to know that I greatly appreciate the privilege of bringing you a word of welcome as you begin the Fifth Annual Reciprocal Meat Conference.

The fact that you men are meeting here for the fifth consecutive year indicates that the deans of your institutions, as well as yourselves, are impressed with the value of these conferences in intensifying the meats activities at your colleges and universities. We all recognize their importance in broadening our programs of meat research, instruction and extension so that we may better serve our institutions as well as our respective states.

Here we profit individually and collectively by sharing experiences, by exchanging ideas and by discussing mutual problems. You will go back to your work, I am sure, with a keener appreciation of the importance of your tasks. Let me congratulate you on your opportunities -- opportunities which are practically unlimited.

Your accommodations have all been arranged for and you all have a program of the meetings. As in past year, Mr. Tomhave has worked hard in preparation for the conference, but we regret that he will be unable to preside. Professor Bray will take over that task.

Tomorrow night you will be guests of the Board at your annual banquet which will be held in the Normandie Room on the second floor of this hotel. I know you will enjoy the addresses to be given at this event by Mr. Wesley Hardenbergh, President of the American Meat Institute, and Dr. Lyman E. Jackson of Pennsylvania State College.

Your sessions will be concluded Thursday morning at a grading clinic to be held at the Wilson & Co. plant. Arrangements have been made for your bus transportation there and back.

You will return in time for the luncheon held in connection with the first day's session of the Annual Meeting of the Board. Remember that you are all invited to attend the two-day session of the Annual Meeting, which will be attended by some 325 representatives of the livestock and meat industry from all sections of the country.

We want you to be our guests at the annual banquet and dinner program of the Board, Thursday evening at 7:00 P.M. in the North Ballroom. The main address is to be given by Allan B. Kline, a member of our Board of Directors and President of the American Farm Bureau Federation. Another feature of the program will be the honoring of Dean H. P. Rusk of the University of Illinois.

We have arranged for a stenotype operator at your meetings to secure all the reports and discussions presented during the various sessions. These will be edited by your committee and a bound volume of the entire proceedings will be published by the Board and made available for you by January, 1953.

We want to be of all possible assistance to you during this conference. If we can help you in any way, feel free to call upon us. Thank you for coming, and best wishes for a successful conference.

- - - - - -

CHAIRMAN BRAY: Thank you, Mr. Pollock.

It is with a great deal of pleasure I greet you at this Fifth Annual Reciprocal Meat Conference. We are aware, I am sure, of the magnitude of this conference and its many benefits. No other group of individuals that I know of are as fortunate as we are in having the support of an organization such as the National Live Stock and Meat Board. We are indeed indebted to the Board for these fine facilities, staff assistance, and for the publishing of the Proceedings of this conference.

Once again we have gathered here to exchange ideas and discuss the many phases of meats work being carried on at our colleges throughout the United States. With us also are men from the U.S.D.A. who likewise are intensely interested in this field.

The various committees have indicated that they have a very interesting program for us, reflecting in part the fine efforts put forth by the members of our group. Each committee chairman will be in charge of the program relating to his committee's report. We hope that we can adhere to the time allotted to each report, yet at the same time clear up all points of discussion.

Gentlemen: There is one announcement to be made at this time. That is the appointment of a Nominating Committee for the nomination of men to serve on the Executive Committee for next year's conference.

The following men have been listed: A. M. Pearson, as chairman, University of Florida; W. J. Aunan, of Minnesota; George Vander Noot of New Jersey; E. A. Pierce of South Dakota; and E. A. Kline of Iowa.

Getting into our program for this morning you will note that the Teaching Committee is the first committee to report. We have a new chairman of that committee this year. Larry Kunkle started the work of the committee last year and he did a very good job. But because of his responsibilities on the Executive Committee, he and the committee have turned to Vern Cahill to carry on the good work.

* * * *

TEACHING COMMITTEE

1. V. R. Cahill, Chairman,
   Ohio State University, Columbus, Ohio
2. P. A. Anderson, University of Minnesota, St. Paul, Minnesota
3. Sleeter Bull, University of Illinois, Urbana, Illinois
4. R. A. Edgar, Virginia Polytechnic Institute, Blacksburg, Virginia
5. L. E. Kunkle, Ohio State University, Columbus, Ohio
6. J. I. Miller, Cornell University, Ithaca, New York
7. W. L. Brown, University of North Carolina, Raleigh, North Carolina

MR. CAHILL: On behalf of the Teaching Committee, greetings to each one of you.

In setting up this program, we were interested not only in talking about teaching but also to attempt to teach teaching, and not only to have something informative but also something interesting. In that attempt, we have lined up first on the program something which I think will very well fill those qualifications. I am not going to make the introduction for this first portion because some of this passing around that Chairman Bray has indicated can also go two ways.

I am going to ask the man who was instrumental in laying the groundwork and nursing along this project of getting Mr. Gallery here to speak to us to introduce Mr. Gallery. I am speaking of Mr. Kunkle, the man who passed along some of these responsibilities, Mr. Kunkle.

MR. L. E. KUNKLE: We may all associate with minerologists and other people who know all the points about carbon in a knife. But when it came to being able to pass it on to someone else, at least those of us on the Executive Committee felt that we did not have enough soap to go around.

So we canvassed the field, and it seemed that the folks who had done the most for this conference, particularly in the presentation of the displays that we have here again today, would be the folks to go to for some help. We were both surprised and pleased to have the General Manager of the Russell Harrington Cutlery Company acknowledge the request and offer his personal service. So without any delay we accepted his offer, and he is here this morning with certain paraphernalia to enlighten each of us who is working with tools, and who particularly are trying to teach boys how to use sharp tools.

We are proud to present Mr. J. D. Gallery, who has chosen to give us the basic story on the manufacturing of tools that are used in the meat industry.

# # # # #

MANUFACTURE AND MAINTENANCE OF PACKING HOUSE CUTLERY

J. D. GALLERY
RUSSELL HARRINGTON CUTLERY CO.

I am very grateful to Professor Kunkle for inviting me to appear before you to talk to you on my favorite subject, the manufacture and maintenance of cutlery such as is used by the meat industry. Many of my remarks may be elementary and obvious, and those of you who are familiar with metallurgy and manufacturing processes are asked to bear with me. I will apologize in advance to those of you who may have written a textbook on any of these subjects and assure you that I am not trying to be presumptuous.

The three basic steps in the manufacture of a good knife are: first, a tool steel of the proper analysis; second, heat treatment to the desired hardness and toughness; and third, grinding to the proper tapers and to a sharp cutting edge. While there are from 50 to 100 separate operations in the making of a knife, these three steps are of prime importance. Each operation has its purpose and adds to the sum total of quality and service, but it is evident that to meet the requirements of the industry, a knife must rate high when checked against these three characteristics.

SELECTION OF MATERIAL

The type of steel used for packing house cutlery is known generally as a high carbon tool steel. This table represents a typical analysis of such a steel.

Element	%
Carbon	1.00 - 1.10
Manganese	.30 - .40
Silicon	.10 - .25
Phosphorus	.02 - Max.
Sulphur	.02 - Max.

Carbon is the element which gives the hardening qualities to the steel. Usually, the higher the carbon content, the harder the steel when heat treated. A 1.00% carbon steel is considered the best for making knives. Some less expensive knives are made with lower carbon content but are not satisfactory because they will not hold an edge. Manganese is added to increase the strength of the steel. It also acts as a scavenger to counteract the effects of harmful oxides and gases. It eliminates the harmful effects of sulphur. Silicon is added to produce sound steel, that is, steel free from blowholes. It is a more efficient deoxidizer than manganese. Silicon in tool steels increases the depth of hardness penetration. Phosphorus and sulphur are impurities which should be kept to a minimum. This is why, in the analysis, these two elements are expressed in terms of maximum percentage allowable.

High grades of cutlery steel are made in electric furnaces under closely controlled conditions. The quantities are relatively small and the analysis and temperatures are more easily held within close limits.

Stainless steel is widely used for household cutlery and some institutional and restaurant types of cutlery. There are many types of stainless steel but only one with the proper heat treating ability that should be used in making knives. This is known as a 440C type and contains 1.0% carbon and 18% chrome. It can be heat treated in manufacturing to the same hardness as carbon steel blades. Since most knives used in the meat industry are carbon steel I will concentrate on this type.

The other basic material used in knife making is the wood used for handles. The meat packing industry has a decided preference for beech wood. Other native woods such as birch, maple, ash and walnut are sometimes used, but because of the preference of the meat packing industry, we have standardized on beech wood for handles on these knives. Beech wood seems to be preferred because of its texture and its ability to absorb some of the greases, fats and oils without becoming slick and slippery. Basically, any hard wood which will not splinter or bleed could be used for knife handles.

MANUFACTURING OPERATIONS

Forged knives used in the meat packing plants such as skinning, boning and butcher knives, start through a cutlery factory in the form of a rectangular bar of steel. These bars are first cut to the correct length. These shorter pieces are placed in a forging furnace where they are heated to about 1700° and then, still hot, they are hammered out in a forging hammer, being held at one end in a pair of tongs by the operator. This is how the blade is hammered out so that the edge is thinner than the back and the shape of the blade is approximated. For example, the skinning knife is curved by such an operation. The purpose of forging is to improve the grain structure of the steel and to provide the proper weight distribution of the blade. The skinning knife with its requirement of a heavy back thickness and a center of gravity forward of the handle cannot be made, practically, by any other method. The tang end of the blade is thinned out in a similar manner by heating this end in a furnace and hammering it out under a forging hammer while the operator holds the blade end in a pair of tongs. The final shape of the knife is obtained by using a two-piece tool known as a punch and die. The punch is a tool which has a projection the exact shape of the knife. The die is a larger piece, having an opening the same shape as the punch and into which the punch will fit snugly when brought together. The punch and die are set in a press, and in the operation the forging is placed on top of the die. When the ram of the press comes down, a blade the shape of the punch is punched out of the forging and drops into a pan underneath the press. The remainder of the forging, called the skeleton, is discarded as scrap.

Subsequent operations, such as punching holes for the handle rivets, straightening the blade, and smoothing out the back edge are then done and the blade is ready for heat treating. The reason for heat treating is to impart to the blade the necessary hardness and toughness. For forging, blanking, punching holes, etc. the steel has to be in a relatively soft condition. To be useful as a knife, it must be hard and tough.

HEAT TREATING

Heat treating consists of the two operations of hardening and tempering. Hardening is accomplished by immersing the blade in a pot of lead, which is in a molten state, having been heated to a temperature of about 1520°. As the blades are heated by the lead, the structure of the steel undergoes changes. There is a change which takes place among the molecules of the metal. When the skinning blade has been heated to 1520° the structure of the steel is at the best condition for making a knife; the blade is then taken out of the pot and quickly dipped in a tank of oil, rapidly cooling the blade. This locks the grain structure in the one best condition and the combination of heating to the hardening temperature and quickly quenching in oil, hardens the blade. The grains are small, fine and uniform and a fracture under magnification shows a shiny pearl gray color. At this point, the blade is completely hard and has a Rockwell hardness of 65. Rockwell is a standard means of measuring relative hardness. A piece is placed in a machine which measures the amount of indentation of the surface by a diamond point under a fixed load. The indentation is shown on a dial on the front of the machine. In this condition, however, the blade is too hard and too brittle. The structure of the steel is under severe strain because it has been subjected to such a rapid and severe change in temperature. If used in this state, the edges of a knife would chip out readily and the blade might break. Because of the extreme hardness, it would be difficult to sharpen.

These strains are relieved in an operation known as tempering. This operation increases the toughness of the steel and at the same time lowers the hardness slightly. The blades are placed in an electric furnace and heated to about 520° and kept at that temperature for 1-3/4 hours. This results in a Rockwell hardness of 55 to 56. The blade is hard enough to be ground and to keep a cutting edge, and is a tough, durable tool which will give good service. There is a difference of opinion in the industry as to the final hardness. These very from 50 to 58 but based on our years of experience, we have found 55 - 56 to be the best. 50 is too soft and 58 is too hard. 55 to 56 gives an edge which will cut and stay sharp and can be readily sharpened.

Both operations of hardening and tempering are closely controlled. Instruments on each pot maintain the temperature of the lead to within 5°. The operator has a very sensitive instrument which shows him the exact temperature of the pot at all times. On the electric tempering furnaces, there are recording instruments which record the temperature changes during each day's run.

GRINDING

The first grinding operation is done on a grinding machine which uses a cylindrically shaped grinding wheel. A strong flow of water is used to keep the blade cool and to help in the grinding. The machines are operated in pairs, each machine grinding only one side of the blade. These machines can be set to grind a taper from the back to the edge and from the handle to the point. A flexible blade, such as a ribbing knife or trimming knife, has most of the flexibility ground into it in this operation.

For each blade to be ground, there is an approved sample against which the production run is checked from time to time by a roving inspector. After the production lot is ground, the blades are dried and then inspected by an inspector who is provided with an approved sample.

All packing house blades then go to a hand grinding operation where the points are thinned down and the edge is ground on the blade. This is done on large grindstones 54 inches in diameter and 6 inches wide, and the operator sits on a saddle-like seat. On best quality knives, a fine feather edge is ground on the blade. When a feather edge is obtained, it is proof that the edge is ground sharp. To prevent burning, a stream of water is kept playing on the wheel. On very flexible blades, such as ribbers and trimmers, this operation is used to obtain the exact flexibility required. This is a very highly skilled operation requiring lengthy training.

One very important consideration in the shape of the blade and in its grinding is that of balance or "hang." This is difficult to explain or to illustrate but actually it is one of the most important features of a professional or industrial knife. To a man who is using a knife all day long as a tool to help him earn his living, the balance of a knife is of prime importance. The balance has to be just right in order that he will not get tired using it. In many cases, the nature of the job will call for a special "hang." On a skinning knife, for example, the weight must be toward the tip because the knife is used on a downward stroke. Larger knives have to be in proper balance to relieve the feeling of weight. This is why our Dexter line has proved so popular because of our design where the tang of the blade does not go all the way through the handle. Considerable weight in the handle is eliminated and better balance is achieved. Most competitive knives of the same gauge are much heavier and more clumsy in handling.

BLADE FINISHING

There are several operations grouped together and known as blade finishing operations. These finishing operations consist of polishing the backs, edges and sides of the blade in separate operations. To obtain a high polish, it is necessary to do these operations at least twice. The first time a coarse abrasive is used to remove all deep cuts and scratches and the operations are then repeated with a finer abrasive which serves to give a polish or lustre to the knife. The backs may be finished one at a time or several together held in the operator's hand. A canvas wheel covered with abrasive or an endless abrasive belt is used to do this operation. The edges are sharpened and polished one at a time using a somewhat softer canvas wheel covered with a finer abrasive. At this operation, the feather edge is re-established. Blades are inspected after this operation just to assure that the edge is ground sharp. The sides of the blade are finished by passing between two canvas wheels coated with abrasive, where both sides are polished at the same time, or by placing several blades on a rack and passing them in a hydraulically operated machine between two rolls about 36 inches long which have been coated with glue and abrasive.

If the blades are to be mirror polished, they are passed through a polishing machine in two operations to further refine the scratches and marks and to give the blade the very high finish.

Blade marking or etching is considered part of the blade finishing group and is done after the final polish has been applied. There are many different ways of marking a blade and each has its advantages and disadvantages. We use an acid etching process wherein we stamp our trademark through a coating of wax which has been applied to the blade. An acid solution is applied to the stamp and etches the blade along the lines of the stamp. The acid and wax is then washed off and after another inspection, the blade is complete and ready for assembly to the handle.

HANDLE MANUFACTURING

The woods most commonly used to make cutlery handles are Rosewood, Kingwood, Beech, Birch, Maple, Walnut and Ash. As mentioned earlier, handles of Beech are preferred by the packing house industry. Rosewood has more beauty, is more durable, and is preferred for restaurant, kitchen, bakery and home types of cutlery. The imported woods, such as Rosewood and Kingwood, are imported in log form from Central and South America.

The Beech wood is purchased domestically in plank form and is stored for several months in sheds at our plant. The first operation in making a scale, which is the name for each piece of a two-piece handle, is to cut across the plank. On our Dexter line, the handle is a solid one-piece handle which is slotted to fit the tang of the blade. The plank is 1-3/8" thick and this cross cutting results in a block 5" long, 1-3/8" thick and several inches wide. The 1-3/8" dimension represents the width of the tang of the blade. This block is then sliced into thin pieces about 1/4" thick on a smaller saw.

These scales are then placed in a drying room under a temperature of 115° and controlled humidity to remove the moisture from the wood. The scales are kept in the drying room from 21 to 28 days until by test the moisture content is 6% or less. When the scales have been dried to this point, they are ready to be made up into the final shape.

The first operation is to plane the two flat sides to final thickness. This is done on a planer equipped with two planing heads. The pieces of wood are fed by a hopper through the two heads, each head planing one side of the scale. The next operation is called "spotting" and in this operation the scale is cut to length and the ends squared. The pieces are fed on a drum past two saws which cut and square the ends at the same time. The sides are then bevelled and shaped by means of cutters controlled by cams on a scale planing machine. The bevel at the butt end of the scale is then cut in in a separate operation. The 5 rivet holes are then drilled in a drill press. After a visual inspection, the scales are ready for assembly with the blade.

ASSEMBLY

Most knives used in meat cutting are assembled by riveting the handle to the blade with compression type cutlery rivets. These rivets are made in two pieces. One rivet has a hole drilled the length of the body and the other rivet is driven into this hole expanding the walls of the rivet and locking the blade and handle together. There is still a preference on the part of the packing house workers for the older type of straight wire pin riveting and most of the Russell line of packing house knives are assembled with this type of construction.

HANDLE FINISHING

Wood is not a material suitable for precision manufacturing. The practice is to make the handles to fit snugly on the tang of the blade and then smooth down the edges and blend in the handle and the metal of the tang on sandpaper discs or straps. The two thin edges of the tang have been left rough and black and are polished and finished as part of this operation. On Beech wood handles, this can be done in one operation. However, on polished handles such as Rosewood, several operations are necessary to obtain the high polish which is standard on this type of wood. Successively finer sandpaper is used to obtain a smooth surface and the final polish obtained by polishing by hand on a high speed cotton buff. No wax or stain is used to get the high polish.

In between these handle finishing operations, the handle is marked or branded. This is done in an embossing machine using heated printing type to stamp and burn in the knife number, the company name or the customer's name.

FINAL OPERATIONS

The final operations consist of washing and cleaning the blade and handle, the final inspection, hand honing the edge, and wrapping and packaging. The hand honing is done at the very end to remove the feather edge which was ground at the hand stone grinding and re-established at the edge polishing operation during blade finishing. The hone used varies in size depending on the length of the blade. A hone 12" long, 2" wide and 1" thick would be used for a 6" boning knife. This is a fine hone having a 400 grain size and of medium hardness.

The blade is honed by drawing it straight down the length of the hone, holding the blade at a slight angle. Three or four strokes on each side of the blade is sufficient to remove the feather from the edge and leave it smooth and sharp. Our Dexter knives leave the factory sharp and are ready for use without any further grinding or sharpening.

INSPECTION

In describing the manufacture of knives, some mention has been made of inspection but this phase is important enough to be discussed as a separate paragraph. A boning knife has eleven separate and distinct inspections. These points of inspection are set up after key operations or group of operations. This is done to insure that the blade is correct up to that point before it is allowed to go to the next operation.

There are many operations of a minor nature not described. In all, there are 56 operations in the making of a Dexter boning knife and 53 operations in the making of a Russell skinning knife.

MAINTENANCE OF KNIVES.

It should be realized that a knife is a hand tool made for the specific purpose of cutting or slicing some relatively soft material. To give good service, a knife must be properly used and not abused. A knife, like any other cutting tool, will get dull through use. Properly made, it will stay sharp for a reasonable period, but the time will come when the fine edge will become dull and will need restoring. It is in restoring the edge that much abuse is practiced.

Edges can be restored in several ways, but it seems logical to say that the best way is to follow as closely as is practical, the manufacturing operations by which the edge was ground originally. Butcher steels will help to maintain an edge and practically all butchers, chefs, and packing house workers make use of this tool. The steel, being harder than the blade, will remove the very fine rough edges which appear on the blade as the edge breaks down.

However, the time comes when the edge breaks down enough so that it is too thick to cut easily and more material has to be removed from the sides of the blade to restore the edge. The best way to do this is by grinding the sides of the blade on a grinding wheel under a stream of water. In other words, the same way as the edge was first ground in the factory. The grinding wheel should be of a grain size from 120 to 240 and of medium hardness. The stream of water prevents the blade from being heated and burned. The edge of a knife is thin and can easily be burned without very much pressure if ground on a dry wheel. To be burned, a blade must show discoloration. At the area of discoloration, the hardness has been removed and the blade in that area is soft. However, if a discolored blade is then polished to remove the discoloration, the blade is still burned and is still soft in that area. The feather edge which appears as the result of grinding can be removed readily by giving the blade 5 or 6 strokes on a hone. The hone should have a grain size of 400 or higher. The blade should be held almost flat on the hone with the back of the blade raised at an angle of about 15°.

In maintaining an edge on cutlery in your home which does not get the continued use of industrial knives, the honing operation, if done every week or two, will keep your knives sharp.

- - - - -

MR. R. L. HENRICKSON (University of Missouri, Columbia, Mo.): I should like to know if it is possible to rework steel that has been nicked.

MR. GALLERY: Are you talking about a serrated steel?

MR. HENRICKSON: A smooth steel.

MR. GALLERY: A smooth steel, yes, it could be. However, if you had to take too much off the cross-section and make it too small, it probably would not make too satisfactory a steel. But if the nicks are not too bad and you want to send them back to the factory, we will reduce them, if it is practical to do it.

MR. J. J. WANDERSTOCK: Just thinking out loud, I wonder whether Russell Harrington are planning to put out a leaflet on the manufacture and maintenance of cutlery.

MR. GALLERY: As I understand it, this paper will be incorporated with the minutes of the meeting. Is that right?

MR. KUNKLE: Yes.

MR. GALLERY: If that is done you will have a source of information. The cutlery industry for a good many years has been one of those secret societies in which "nobody tells nobody nothing." You know that type of thing. But I feel that there really are not that many secrets. Many of you have probably met Mr. Durrell who was our General Manager and Sales Manager for the last twenty-five years. His philosophy was that making good cutlery is a matter of intent. If you start out with the idea that you are going to make good cutlery and that is your aim and goal, there is no reason in the world you cannot make good cutlery.

We have been in this business since 1818 and we believe that over the years we have acquired a lot of know-how and knowledge, tradition and good old New England workmanship.

MR. C. H. ADAMS: Is there any advantage of the full tang over the half tang or vice versa?

MR. GALLERY: I don't know why in the beginning Dexter was a half tang construction. We feel that the only advantage is that you get a much better balance.

With the full tang you have a lot of heavy material down in here that makes this weight heavy, that makes the knife feel heavy, and I think it will tire a man using it all day long. The skinning knife is full tang, but in forming it, it has been thinned down. It is very thin on the end, and you get the proper weight distribution. Even though it is a full tang job, it has the proper balance.

MR. A. W. OLIVER: Is there any way of telling whether stainless steel knives have been manufactured from 4.40 C? Are they labeled?

MR. GALLERY: No. I understand that in the beginning, Mr. Durrell wanted the cutlery industry to get together and use some kind of symbol like that used for sterling silver, to use a star or something to identify it that it was the type of stainless steel that should be used, but he did not get very far with it.

MR. O. D. BUTLER, JR.: If we had some type of teaching aids, pictures or something to show what they should look for in the different kinds of edges, that we could put into the hands of our students, I believe it would be a wonderful help. I just wonder if you might be able to put out something of that nature.

MR. GALLERY: Well, there is a booklet which shows you how to use a steel, which is only the first step, I would say, in maintaining a knife. I think that book was put out by the National Live Stock and Meat Board, or in conjunction with them. It shows Max Cullen carving meat, and in the back it shows how to use the steel. That is something we probably should consider. The cutlery manufacturers have an association, the American Cutlery Manufacturers Association, and quite possibly it could be done through an organization like that.

This booklet has some information it it. It says, "Selection and Care of your Knives." It is written more for the housewife, but it shows the different kinds of grindings similar to what I showed. Here in the center panel it says, "How to keep your knives sharp." It shows the steel there and the stone for paring knives.

You might look at that, and give me your comments. If that covers it, okay. If it does not, we might be able to do something else.

MR. LEONARD KAMM: Other than buying Dexter or Russell Harrington knives are there any general rules in the choice of a good knife?

MR. GALLERY: Well, I would say that first it depends upon what you want it for. I think if you want a flexible knife, for instance, you should test it. Put a little weight on it and flex it and see if it bounces back. To do that it would have to be a good grade of steel, and it would have to be properly heat treated. You have difficulty with stainless if you grind it too flexible. The chrome that you add to make the stainless detracts from its flexibility, the spring temper in it, and you can break a stainless steel knife if you push hard enough on it. That is just the nature of the steel, because the chrome and the nickel are sort of deadening agents. They don't add anything to the life of the knife. Your good grades of cutlery steels are not highly alloyed.

MR. CAHILL: I hesitate to interrupt these questions, but I am sure Mr. Gallery will entertain any questions you might have privately after the session.

MR. GALLERY: I should like to introduce the two men who are with me. Mr. George Tupper, whom you have met. He has been around here for a lot of years. He is the very fine midwestern representative for Russell Harrington. And Mr. John Porter, who is working with George and learning the cutlery business. We have high hopes for him and he is coming along in pretty good shape.

MR. CAHILL: While this syllabus is being passed, I should like to make known the members of this committee. Professor Paul Anderson. Professor Sleeter Bull. Here we have W. L. "Bill" Brown from North Carolina. On my left, Ralph Soule from out Kansas way. And the ex-chairman who has been promoted to the Executive Committee this year, Professor L. E. Kunkle of Ohio State. Bob Edgar indicated that he would not be able to be with us this year. Professor J. I. Miller, from Cornell, wrote and said that he would not be able to attend, and that George Wellington was going to represent him this year. At the last minute duties at home made it necessary for George to cancel out. So we are getting along without those folks at this time, although they were instrumental in getting our material together.

We thought it would be well to have a little resume of what this committee has done. Since we see such a large freshman class here this year we know that it is doubly important. The logical person to bring us up to date on this is the former chairman, Professor Kunkle. May we ask you at this time to brief us on what has happened in past years?

MR. KUNKLE: Your teaching committee is the result of the planning and organization affected by the Executive Committee which functioned and was responsible for the 1950 Reciprocal Meat Conference. The number one objective of the 1949 meeting was to inspire and enthuse those who teach meat courses. Mr. Tomhave's statement of objectives included improvement in standards of teaching along with research and extension. He closed with a plea to do our best to help enhance the prestige of the meat teacher.

When the Teaching Committee of 1951 Program received its instructions from L. J. Bratzler, the first Executive Committee Chairman, the chief assignment was to prepare a Basic Meat Course Syllabus. The task was considered by the committee, and modest plans were layed to obtain teacher participation from all the Institutions. Last years program we carried 5 topics which were presented by various members, but we were short on the syllabus production.

The Teaching Committee had a follow-up meeting last June and resolved to complete the 1951 task. Delinquent course outlines were to be pursued and included in the syllabus to be prepared during the year. Mr. V. R. Cahill has carried the responsibility of Chairman and has led in the preparation of the syllabus for a basic meat course. We were agreed that teaching is in need of help in order to compete with television and other things in the work-a-day world for student time. There are certain topics and features in meat education that are important and should be taught to students regardless of the address of the Institution or the name and experience of the instructor. It is with this goal in mind and an ambition to share in our common responsibility that this year's committee has pursued its task and is today receiving the report of "A Basic Meats Course for College Students.

MR. CAHILL: Thank you, Professor Kunkle.

I was waiting for that word "substitute." A man frowned at me just last Friday afternoon when I used that word. He said, "I don't like to hear it. It infers an inferior product." But after our discussion of the Dexter and Russell Harrington cutlery we realize that there is no substitute for the genuine.

To get right along with this syllabus, if you will notice, we have indicated a time allotment, and it was astounding the various number of hours that were allotted to this basic meat course at the various instituions, from a very few hours to a great number. We tried to establish here some average. Something on which we could work. The quarter system, as you notice, we have indicated might be three credit hours for thirty hours total of lectures, and five credit hours for laboratory, if the laboratory is taught in the course. The semester system would vary a little in the allotment of credit hours and the hours of lectures and laboratory.

So with those suggestions in mind, we went ahead with the syllabus. We compiled the topics which are taught at the various institutions, and then we attempted to compose this syllabus, sometimes being guided by the number of times a particular subject was taught at the twenty-one institutions represented with their course outlines, but not always following that particular scheme.

We realize, too, that we are probably doing this work for the younger folks of this conference. Those who have been teaching meat courses for many, many years, no doubt from experience, just as in the cutlery business, have developed a course which is almost foolproof. Those who are just starting or who have been in meats teaching for only a short time I am sure can glean some information from this syllabus. It cannot possibly fit every situation, but we hope that some information can be gained.

We should like to lead off with the first portion of this syllabus on the lecture outline and hear what Professor Sleeter Bull has to say about those topics as we have listed them here, Professor Bull.

# # #

COMMENTS RE: SYLLABUS OF A BASIC MEATS COURSE

SLEETER BULL
UNIVERSITY OF ILLINOIS

The history of the livestock and meat industry and its present significance is important. The Malthusian theory, which is now being revived as an argument against meat production, should be discussed. It should be pointed out that 80 percent of our beef and 85 percent of our lamb and mutton are produced from pasture and roughage; that much of the range land is unfit for cultivation of crops; that pastures and legumes on cultivated land are essential for maintenance or improvement of soil fertility; that much more labor is gainfully employed in the processing of meat products than plant products; that only 9 percent of the corn crop is fed to beef cattle and 3 percent to sheep.

The study of anatomy and myology should be restricted to the edible offal, the principle inedible offal and the names of a few of the more important muscles (See Bratzler's blueprints). This may be done mostly in the laboratory.

The histological structure is important for a thorough knowledge of factors affecting grades.

Post-mortem changes deserve only slight attention unless food poisoning is included under this topic. Food poisoning is important. "How do you determine when meat is spoiled?"

Tenderization methods should include ageing, ultra-violet lamps (?), freezing, freezer storage, hot smoking, marinades, enzyme preparations and cooking.

Meat inspection preferably should be handled by some one from the Veterinary College. Any abnormalities observed in the laboratory should be called to the attention of the students and the veterinarian called in to discuss them.

Grading standards should be discussed and demonstrated and the uses of the different classes and grades pointed out. It requires many hours of laboratory work to produce a good meat grader.

- - - - -

MR. CAHILL: Thank you, Professor Bull.

I think rather than stop for discussion of each group as we go along, we might continue with our panel discussion. Professor Brown has agreed to handle the next section of this lecture outline.

# # #

PRINCIPLES OF PRESERVATION AND CURING

W. L. BROWN
NORTH CAROLINA STATE COLLEGE

This phase of instruction in our basic meats course is a "must." The first methods employed to preserve foods were probably drying and smoking. Early man was concerned primarily with quantity. Today man is concerned also with quality and recognizes among food problems those relating to purity and cleanliness of foods supplied to the public.

The object of preservation is to keep foods for relatively long periods and still maintain their quality. Preservation may be accomplished in meat products by (1) the addition of chemical substances. Curing is an example; (2) using low temperatures. Refrigeration at chilling temperatures is a temporary method of preservation and freezing preserves the product for a longer period of time; (3) using high temperatures such as are used in canning; (4) abstraction of moisture or drying.

Proper curing methods are an important part of our basic meats course at North Carolina. It has been estimated that from 10 to 20 per cent of the cured pork is lost annually in many of the counties in North Carolina. Assuming that 75 million pounds are cured annually and that the average loss for the state is 10 per cent this would be a loss of 7½ million pounds of pork annually.

LARD AND SHORTENING

It would be desirable to include both the problems encountered in rendering lard on the farm and in the packing house. In the discussion of farm lard rendering the percentage yield, most acceptable containers for rendering the pork fat and correct methods of storage might be emphasized.

The packing house lard can be classified according to the method of rendering and differences between these methods should be pointed out. Newer methods of rendering lard by the packing industry are important as well as the use of anti-oxidants to prolong storage life.

Lard substitutes and shortenings are gaining in popularity with the consumer. The advantages and disadvantages of lard substitutes and shortenings should be discussed.

SAUSAGE MANUFACTURE

It has been estimated that one out of 12 pounds of meat produced in the United States is consumed as sausage. To introduce this topic a brief history and the present status of the sausage manufacturing industry should be sufficient. Further information might include the equipment, ingredients, containers, quality and yield necessary to produce a desirable product. A classification of sausages and examples of each could be a part of the lecture material presented on sausage manufacture.

Federal regulations as they apply to sausage manufacture and problems relating to discoloration, packaging, rancidity, etc. may be discussed if sufficient time is available.

PACKING INDUSTRY: ORGANIZATION AND OPERATION

The packing industry handles a large percentage of the meat products that are sold. The main factor responsible for the growth of this industry is concentration. This concentration reduces the consumer cost of the edible portion of the animal. Here again a brief history of the development of the industry might be desirable. The location, efficiency of operation, inspections and various departments of the packing plant can be included as a part of the training. The fact that there are opportunities in the packing industry for college graduates who have majored in animal husbandry should be emphasized.

LIVESTOCK MARKETING AND LIVESTOCK LOSS PREVENTION

Livestock marketing as it relates to the price received for the carcass and purchase of livestock on a grade or yield basis should be included as a part of the basic meats work.

The bruising of livestock may well be considered the major problem in loss prevention work. Proper instruction in this part of the course may help eliminate losses which reduce the value of livestock and meat products. It would be desirable to cover the extent of injuries, types of bruises, location on carcasses and the monetary loss. Providing better overall facilities, stockyard safety programs, truckers safety programs, and the proper farm facilities could be emphasized as means to reduce losses.

MERCHANDISING: WHOLESALE, WITH METHODS OF DISTRIBUTION

The student should be acquainted with the transportation of the wholesale product from the central plant to the branch house and the problems encountered in selling the wholesale product. The trend to eliminate the wholesaler and sell the product direct to the retailer could be an important part of the training in this phase of the basic meats course.

- - - - -

MR. CAHILL: Thank you very much, Bill.

We are at the point of the program now where the chairman must openly admit his inefficiency. I suppose that when R. A. Edgar, of Virginia Polytechnic Institute, wrote and said that he could not attend this year an efficient chairman would immediately have transferred that responsibility to some other member of the committee. They were, however, already busy on their various topics, and so I assumed the task of Bob Edgar and will pinch-hit for him in discussing this last portion of the lecture outline.

# # #

RETAIL MERCHANDISING

V. R. CAHILL
OHIO STATE UNIVERSITY

In discussing these topics of the syllabus, which have been allotted to me, I would like to merely mention a few of the pro's and con's incident to the inclusion of these subjects in the meats course. Mr. Brown has discussed merchandising on the wholesale level, which I think we have pretty well agreed is essential for a basic meats course. Retail merchandising may raise more of a question in the minds of a few of us. However, I feel that a fundamental knowledge of retail merchandising will tend to make us more tolerant and understanding of the functions and problems of those individuals in this much-discussed meats team. More recently methods of cutting and procedure for processing product intended for freezing have come into vogue. A large percentage of our folks have some connection with frozen meat either as locker renters or home processors.

Meat pricing is a way to emphasize our meat merchandising procedures. Dollars and cents are words which everyone can understand. It is a means of emphasizing and giving a graphic picture of the value and preference which have been indicated for various cuts of meat. If we are to fully understand our economic situation, we need a somewhat broad background concerning the areas of livestock production tied in with the amount of meat consumed and where it is consumed. Some of the factors, whether habit, financial, or need as they affect meat consumption, can contribute to a worthwhile discussion. We ought to have this fundamental information relative to this great livestock and meat industry.

Care of meat in the home seems to be one of the more practical phases of our meats course. It is something that would apply to any student, no matter what his major interest, and needs to be emphasized, I believe, because of the common ignorance of proper care. All of our efforts in production and processing meat can go to naught unless it is cooked properly, so why shouldn't we attempt to at least call the students attention to the fact that there are proper methods of cooking. If there is sufficient time in this basic course, perhaps we could go further. Carving, I think, is something which is of secondary importance in a basic course and is being taught in a few of the present institutions.

Principles of refrigeration and cold storage is a controversial issue. One side of the story is well phrased by Professor Bull, who says that it is too technical for a meats man to include in his usual classroom discussion and requires the assistance of a refrigeration engineer and that it is more appropriate for a later course. The other school of thought is that we ought to understand how refrigeration systems operate: perhaps know the kind of refrigerants that are used and the types of refrigeration systems that are most useful and popular and allow the details of refrigeration loads and capacities for an advanced course. Chemical composition of foods could be glossed over very lightly or it could be very time consuming and very technical. Perhaps the middle of the road program is best for such a meats course. Isn't it a way for the student to make practical application of his basic chemistry courses? No doubt he will be interested in the chemical composition of meat if we can confine the discussion to the bearing of food value. And certainly the folks who have had a course in meat ought to have some of this basic information with which to champion their own product.

An old standby in the basic or farm meats courses, as they have been offered, is the item of by-products--ordinarily divided into edible and inedible. I don't believe any of us would belittle the importance of these by-products either to the producer or the processor or the consumer. The discussion of by-products always seems to create considerable interest among the students and is vitally important economically to the meat industry. The dependence of the pharmaceutical industry and in turn our standards of health can bear considerable emphasis in any by-product discussion.

The last item on this suggested syllabus might be considered a catch-all or a cap sheaf. Probably few of the students will remember very little about what they learned in class once they have taken the final examination and departed. But if they carry with them, either in their minds or in their notes, a few sources of meat information, I am sure that they will have cause to use them before they have finished the first year in industry.

A lack of time could justly be the limitation in this basic course of the discussion of new developments in meat. However, if we are to sell this meats program, we ought to at least awaken the student to the continually changing ever-developing field of meat. We ought to attempt to inspire his participation as a leader, a pusher or at least a loyal follower through a brief discussion of the many new developments which are in process today. We ought to familiarize the students with the excellent accomplishments of such organizations as the National Live Stock and Meat Board and the American Meat Institute.

The topics listed under optional represent those which were included in a relatively few of the course outlines which we reviewed. We make no attempt to say that in specific instances these are less important than some of the items listed in the suggested outline. Above all, we wanted to get them on paper so that if you are not already using them, you may wish to include them in your classroom work. They might well be included in some of the longer courses or perhaps definitely considered for more advanced courses.

- - - - -

MR. CAHILL: As we mentioned previously, we established a sketchy laboratory outline, and it was interesting to note as we went over these courses that 20 of the 21 courses reviewed listed laboratory work in slaughter. The course that did not, I understand, is offered in conjunction with a course under another number, the two working hand in hand, and so actually slaughtering at that institution is also considered quite basic to their work.

Now again we had this first portion of the outline well assigned to Professor J. I. Miller, who has a special interest in this livestock appraisal and meat laboratory work. But since he is not able to be with us, I made a few notes before coming to the conference concerning that portion, which I hope will reflect the thinking of this committee.

Care of tools has been pretty well discussed, I think by Mr. Gallery, and the safety precautions I should like to pass off in this manner.

"Butch" McClurg's treatment, some three years ago, of Meat Laboratory Safety convinced us that safety precautions are essential.

Probably livestock is always appraised prior to slaughter but it is the extent of this appraisal with which we ought to concern ourselves Live grading of hogs as carried on by many of our packers and marketing agencies is genuine evidence of the importance of that phase in a meats course. Among meat team coaches the feeling seems to be that live grading deserves a spot.

Of the course outlines that were reviewed for this syllabus inclusion of slaughtering was unanimous and wholesale cutting was nearly so. Such a combination of livestock appraisal, slaughtering, and the cutting follow-through is a combination providing rare opportunity for students of animal husbandry.

I should like to pass the discussion on to Mr. Soule, who will complete the discussion on the laboratory function.

# # #

INSTRUCTING A MEAT LABORATORY COURSE WITH REFERENCE TO RETAIL CUTTING AND FREEZER PACKAGING

R. P. SOULE, JR.
KANSAS STATE COLLEGE

Although I have been in the teaching field for only a short period of time, many problems have come to my mind as to how best to organize and instruct a laboratory section in meats. I am sure that the syllabus prepared by this teaching committee will be of great instructional value to a new instructor in meats.

I wish to make a few comments on two segments from the complete basic laboratory course as outlined in the SYLLABUS OF A BASIC MEATS COURSE FOR ANIMAL HUSBANDRY OR ANIMAL SCIENCE STUDENTS. These two particular segments are retail cutting and freezer packaging.

First, we must realize, I believe, that cutting a carcass of beef, pork or lamb cannot be a mass production proposition if the students wish to obtain the maximum value from their laboratory work. Neither should we plan to train a student to become a skilled butcher. There are certain trade schools which I can refer him to if the student wishes to become one.

Let us for a few moments venture to one of our meats laboratories. Farmer A has brought to the meats laboratory a thousand pound steer to be slaughtered, cut and packaged for his home unit or rental locker.

After the students have spent a laboratory period estimating the weight, grade, dressing percentage and have slaughtered the steer, they come to the following laboratory period with their butcher knives, bursting with blood-thirsty enthusiasm and ready to hack away. The instructor has to yell "Hold it, boys!" How much does this carcass weigh? How much did it shrink and why? What grade is it? What is the carcass worth at the present market price? After they have found these answers, they are ready to begin manipulating the saw and knife. The students should investigate and find the percentage of the hind, fore and each wholesale cut of the carcass. It is our duty to instruct the students as to the variations in the styles of breaking up the carcass, and the best way "to cut your money" out of those wholesale cuts. By this I mean, as a simple example, keeping the knife close to the shank bone when separating the foreshank from the brisket when the foreshank is selling for thirty-three cents and the brisket for forty-three cents.

After the students have made the wholesale cuts and know the per cent they are of the carcass, they are ready to make the retail cuts. On one side of the beef, they will cut the standard retail cuts, bone in, that they would ordinarily find at the butcher counter. They must be able to identify all of these cuts and figure what per cent they are of the wholesale cut from which they came, as well as figuring the per cent of bone, fat, waste and trimmings. During another laboratory period, the other side should be completely boned into such cuts as KC steaks, inside and outside round steaks, inside and outside rolled chuck, waste, etc. Here the students figure the boning percentages of the side, quarter and wholesale cuts. At this time, it becomes rather obvious for the students to see the amount of locker space they are saving for the patron by making the boneless cuts. After wrapping the meat tightly and in sizes according to the number in the patron's family, a complete inventory list is recorded. This inventory should show the total amount of meat to the locker, amount of bone, fat, waste and the cutting shrink. From this dat they can compare the differences between a US Choice and a US Prime animal. For example, the student can also determine the cost that the meat actually costs th patron as it goes into the locker.

- - - - -

MR. CAHILL: Thank you very much, Professor Soule.

To conclude this panel discussion, we thought it was very essential that we call on a wheel horse in the meat teaching field, a man who is as much or more experienced than anyone present. Naturally he is Professor Anderson from Minnesota, and we will call on Professor Anderson now for an analysis of the entire syllabus, including some of the remarks made this morning.

MR. ANDERSON: Thank you, Vern.

It seems to me in the presentation of this syllabus on the basic meats courses, the entire syllabus is not going to fit every institution nor is it going to fit every region of the country, because of the variations under which people desire meat on a national basis. Much depends on what the course and the subsequent courses that are going to be presented later on are going to be. If you have just one meats course you have to broaden it out considerably in order at least to touch upon some of these points that have been listed and not go into very much detail. For instance, if in your institution you have a course that is fitted for girls in home economics, naturally there are some parts of this course that should not go into great detail, keeping that in mind and trying to fit the course to their particular interest and endeavor, to stimulate their interest in meats and to give them some identification, history and origin of the type of meat in question.

On the other hand, it may be a course in meats that is broadly intended for students in agriculture, who just want a broad knowledge of the history of our meat animals and some details on the character of the carcasses. If students are not interested in meats, to force it upon them I think is wrong. However, there is a group that goes through our colleges who are interested in the character of the carcass. A choice beef, a medium grade, and one that is down lower, so that they know the differentiation of the character of our beef supply.

Many of them are, of course, now interested in types of hogs. The fatter the old fashioned butcher type of hog was, the more we thought of him. The present tendency, of course, is toward a lean type. If time would permit I could give you a survey made by four of my students in an advanced class, in St. Paul and Minneapolis, who contacted independent retail dealers, combination stores, and chain stores like National Tea and Red Owl that we have in our area.

On the other hand, there is a group of our students who are fully animal husbandry livestock minded -- some of them want to go even further into packinghouse operations -- who are interested in every detail. Naturally, of course, in presenting courses to groups of that type you have to go very deeply into the history, chemical and physical composition, post mortem changes, etc. We have listed here inspection, what to look for, and tenderization.

MR. CAHILL: Thank you, Professor Anderson. I am sure your remarks are very well taken.

With Chairman Bray's consent, we have chosen to complete this discussion this morning rather than to infringe upon the time of the Meat Judging Manual and Contest Committee this afternoon. In the light of that decision may I also assume the responsibility for indicating a maximum of five minutes discussion concerning this syllabus. If there is considerable more discussion than that perhaps it can be done in the rooms or at a later session of our conference.

The first hand I see is that of Dr. Deatherage of Ohio State.

MR. DEATHERAGE: I won't comment on the syllabus at all, because that is completely out of my field. I cannot refrain from making a comment concerning Professor Bull's aspersion on ultra-violet. That should probably have been in the next speaker's list, because that is a method of preservation, not a method of differentiation.

MR. WANDERSTOCK: Under the optional topics, do you suppose it would be a good idea to spend some time on trichinosis by itself. I notice that you list several places where it could be discussed. Do you think it would merit separate consideration?

MR. CAHILL: I do not expect to do all the talking. Does any member of the panel wish to comment further on that?

MR. BULL: I agree that it should be included especially in connection with some of these home-made sausages.

MR. KUNKLE: Doesn't it rightly fit into pork cookery?

MR. MACKINTOSH: It normally fits into meat preparation and judging.

MR. ANDERSON: I put it under meat inspection, although I explain that they recommend that pork be well cooked.

MR. CAHILL: I think that was true of several of the outlines where it was indicated.

MR. WANDERSTOCK: I mention it, incidentally, in connection with the other things, but I think it warrants enough consideration to discuss it separately.

MR. CAHILL: Your suggestion then would be to include it with the optional topics.

MR. ZIEGLER: I do not think a meats course should even be given that does not take one or two periods for diseases, particularly measly pork as against trichinosis. I make it a point to get that across to my students.

You must have your meat well done, regardless of whether you think you are eating beef or pork, and certainly diseases warrant one or two lectures anyway.

I am interested to see that for the three credit hours in the semester system you have 32 hours lectures and 48 hours laboratory. I believe that is better distribution. We have 15 hours lectures and 60 hours laboratory.

MR. CAHILL: At the expense of this very interesting discussion, I am going to try to uphold my word. If there is no serious objection to closing the discussion, we will do so.

I should like to express my gratitude to the members of this committee who have so nobly assisted in preparing this syllabus and program, and in closing to present this syllabus to you folks for approval or disapproval. With this may I turn the program back to our Chairman who may complete it?

CHAIRMAN BRAY: You presented the material for approval, amendment, or rejection? Is that right, Mr. Cahill?

MR. CAHILL: Yes, sir.

CHAIRMAN BRAY: What action does the conference want to take?

MR. WANDERSTOCK: I move that we approve the report of the Teaching Committee.

MR. COLE: Second.

CHAIRMAN BRAY: The motion is made and seconded that we approve this report. Is there discussion? Are you ready for the question? All those in favor of accepting this report as presented by the Teaching Committee signify by saying "aye"; those opposed. The motion is carried.

(Announcements.)

CHAIRMAN BRAY: We will adjourn until 1:40. That will give us an hour. Let's be back here on time because we have an excellent program for this afternoon.

(The meeting adjourned at 12:40 o'clock.)

# # #

TUESDAY AFTERNOON SESSION

JUNE 10, 1952

The meeting convened at 1:45 o'clock, Chairman Bray presiding.

CHAIRMAN BRAY: Let's come to order, please.

(Announcements.)

CHAIRMAN BRAY: With those few remarks we have a full afternoon ahead of us. So I am not going to dwell on irrelevant matters, and I am now going to go to the next part of the program, which is the Meat Judging Manual and Contest Committee. The chairmanship of that committee has been headed up during this past year by J. C. Hillier and L. E. Walters, and I suppose by next year it will be a one chairmanship job, and the chairman will be L. E. Walters.

I think Lowell needs no introduction to you. He has been a very busy man in the last several months. At this time I should like to turn it over to Lowell, for him with his committee to present the discussion.

MEAT JUDGING MANUAL AND CONTEST COMMITTEE

1. J. C. Hillier, Chairman,
2. L. E. Walters, Co-Chairman,
   Oklahoma A. & M. College, Stillwater, Oklahoma
3. O. D. Butler, Jr., Michigan State College, East Lansing, Michigan
4. N. S. Hale, University of Massachusetts, Amherst, Massachusetts
5. R. L. Henrickson, University of Missouri, Columbia, Missouri
6. E. C. Stillwell, Ontario Agr'l. College, Guelph, Ontario, Canada
7. L. E. Walters, Oklahoma A. & M. College, Stillwater, Oklahoma
8. K. F. Warner, U.S.D.A., Washington, D. C.
9. P. T. Ziegler, Pennsylvania State College, State College, Penn.

MR. L. E. WALTERS: Thank you, Bob.

Gentlemen and Co-Workers in the Meat Field: As most of you know, the Meat Judging Manual and Contest Committee was appointed some year or two ago, and is composed of Mr. Fred J. Beard of the United States Department of Agriculture; Mr. O. D. Butler, of Texas A. and M. College; Nathan Hale, University of Massachusetts; R. L Henrickson, University of Missouri; Jim Hillier of Oklahoma A. and M.; Mr. Ken Warner, United States Department of Agriculture; Mr. E. C. Stillwell, Ontario Agricultural College; and Mr. P. T. Ziegler, Penn State College.

I am sure that most of you furthermore know by this time that Jim Hillier is now in charge of swine teaching and research in our department and during the past year has found himself short of time to work with the committee as he has done in the past. I was asked by your Executive Committee to work with Jim as co-chairman on this particular part of the program and I was more than happy to do what I could in this particular way.

He asked me to express his regret at not being able to attend this year's conference. I think most of you know Jim well enough to know that he is very much interested in the work which this group is doing and has done in the past. If situations develop in which he might be asked to hlep, I know we can count on him for that help.

Mr. Hale, Mr. Warner, and Mr. Beard are unable to make the meeting this year, and we have with us today John Pierce, whom most of you know, who will carry the work which Mr. Beard had planned during the last year.

As Bob Bray announced this morning, we have a few of the blue covered, rough copies of the section on meat judging tossed about the room.

I might say that in so far as this committee is concerned, we want your suggestions on as many of these items as possible.

As the original plan was set up, you will recall the manual was to include judging, grading and identification. The material that is presented in this bound leaflet or notebook, if you remember, was pretty well hashed over last year.

I am sorry to report to you that the section on identification has not been prepared. The United States Department of Agriculture is contemplating a research project, which I am told is already in good form, a project out of which would grow a unified, standardized nomenclature for retail cuts. The committee, with that in mind, is of the opinion that we might possibly delete the portion on identification at this time, with the idea that a couple of years hence, when the material is made available through the efforts of the department that is doing this standardization work as far as retail cuts are concerned, we can hitch on to it and incorporate it in the manual at such time as the conference might see fit.

If you don't subscribe to this view, please make a note on it and when we have time for general discussion, we would like to have your thoughts on it.

I might just say in passing that the National Live Stock and Meat Board have this meat manual, "Identification, Selecting and Cooking," which has some 96 good illustrations of retail cuts, and inasmuch as we have gone along thus far without a manual incorporating the judging, grading and identification, rather than sort of muddy up the water with terms that might be common to some people and not so common to others, I am wondering if it might not be well to wait for this more or less standardized nomenclature which should be forthcoming within the next couple of years.

So far as nomenclature and identification of these retail cuts are concerned, I know that some of you refer to a certain part of many carcasses by one name and others of us refer to the same part possibly by a different name.

Now then, turning our attention to a very important part of this proposed manual, as I mentioned a moment ago, Mr. Beard cannot be with us. We are very fortunate, indeed, however, to have a man who has worked very closely with him and I think is very familiar with the problems that confront us as meat judging team coaches and teachers in the field of meats, Mr. Pierce is going to present the discussion on the grading portion of the manual. So, John, if you will please come forward, we will appreciate your report in this connection.

MR. J. C. PIERCE: Thank you, Lowell.

As Lowell said, Mr. Beard has had this assignment for some -- well, I won't say how long -- with perfectly good intentions, and he would have liked to have been here today, but, as you all know, the pressure of administering a national meat grading program under compulsory grading does not grow much less arduous with the passing of time, and he found it impossible to be here today. So I will now present the paper on grading.

# # #

CLASSIFICATION AND GRADING OF MEATS

J. C. PIERCE
U. S. DEPARTMENT OF AGRICULTURE

Meat grading is a specialized form of meat judging. In order to be a competent meat grader, you must first be a competent judge of meat. There is a difference. In the judging of a class of carcass meats or wholesale cuts, you are taught to compare one with another in terms of an accepted ideal and to place up the one with the "most of the best." Grading implies a grouping into well-defined segments according to an ideal or accepted standard for each segment. Proficiency in meat judging can be and often is accomplished without having acquired a very definite conception of grade. The same fundamentals apply to both -- a thorough knowledge and appreciation of the inherent factors relating to both the quantity and quality of meat.

The origin of meat classification and grading probably dates back to the time when man first started trading in this commodity. In appraising the relative merits of the product, the buyer or seller instinctively applied some of the principles of grading. The early markets in this country were highly localized and a distinct vocabulary or terminology developed on each market to describe trade practices and preferences. However, with the growth of large urban areas and development of improved transportation and communication facilities, large competitive livestock markets developed. This created an immediate need for more uniformity in grading of livestock and meats and a terminology that could be uniformly used so that prices between different markets could be equitably compared.

In 1916 the United States Department of Agriculture formulated tentative standards for grades of beef. These standards were originally meant to provide the basis for a National Meat Market Reporting Service. They were further refined and eventually promulgated as the Official United States Standards for Grades of Carcass Beef on June 3, 1926. Since that time grade standards have been extended to include the feeder and slaughter classes of most species of market livestock and meat derived therefrom. It should be emphasized that the use of Federal grades by the industry is on a voluntary basis and in no way compulsory except during periods of national emergency when they have been made mandatory in connection with price control programs. Individual packers may and frequently do use their own system of grading which may be identified by certain brand names. However, the system of grading described herein is necessarily limited to that based on the official grade standards of the U. S. Department of Agriculture.

The Department of Agriculture inaugurated the official grading and stamping of meat in 1927 on a voluntary basis with the cooperative support of the National Live Stock and Meat Board. This service has gradually grown and now is available in practically every large meat processing or marketing center in the United States. It is operated on a self-supporting basis, the necessary funds being derived from fees collected from the users of the service. Grading is available upon the request of any financially interested party.

FACTORS DETERMINING CLASS AND GRADE

Class as used in its broader meaning refers to carcasses or cut derived from the same species or kind of animal and having a similar commercial use. Sub-classes of carcasses within a specific class or kind of meat usually refer to the sex condition of the animal from which it was derived. It is evident that animals producing a specific class or kind of meat will vary from the best to the poorest individual marketed. Certain of these physical characteristics of a class of meat are associated with its desirability or utility. The grouping of carcasses according to their degree or relative development of these desirable physical characteristics constitutes grading. A grade then includes a group or segment of a class of meat possessing a sufficiently narrow range in grade-determining factors to provide for a high degree of interchangeability of individual units.

BASIS FOR GRADE

The basic considerations in grading meat are twofold--(1) to reflect or measure differences in the proportion of the more desirable to less desirable parts of the carcass or cut and the ratio of meat to bone, and (2) to evaluate the characteristics of the meat which are associated with its ultimate palatability. Grade, as a measure of these two basic considerations, is based on three major grade factors--conformation, finish, and quality. However, since the contribution of finish is primarily to influence both quality and conformation, there is merit in simplifying your analysis to two major factors -- quality and conformation.

CONFORMATION

Conformation as considered in grading meat refers to the proportionate development of the carcass or wholesale cut and to the ratio of meat to bone. Although primarily a function of the development of the muscular and skeletal systems, conformation is also affected by the degree of finish. Thus, conformation is a direct measure of one major consideration in grading meat--that is, the relative proportion of more desirable to less desirable parts and the proportion of edible to non-edible parts.

QUALITY

The relative desirability or expected palatability of the carcass or cut is expressed in the general term of quality. It is a characteristic of both the lean and the fat contained therein and is the most important criterion of palatability. Quality is measured primarily in terms of (1) marbling, (2) texture, (3) firmness and color of lean, and (4) maturity. Evaluation of certain of these important indices of quality is complicated by the fact that most meat is graded in the unribbed carcass and the cut surface of the meat cannot be observed. Consequently, the grader must learn to associate certain other physical characteristics with these indices of quality. Finish is one of these factors. Finish refers to the proportion, character, and distribution of external, internal, and inter- and intra-muscular fat in the carcass or wholesale cut. The importance of the quantity of finish is often over-emphasized. A smooth, thin exterior covering of fat on a carcass or wholesale cut is certainly desirable, and additional fat in excess of this minimum is usually, but not always, associated with increased palatability of the meat. Therefore, distribution of finish as an indication of quality is important, but excessive external finish alone is in itself an undesirable characteristic. The character or kind of fat is also important. Firm brittle fats are to be preferred to the soft oily kind--color of fat is not a grade-determining factor. The quantity of intra-muscular fat evidenced as marbling in the cut surface of the carcass, or the external evidences thereof, is the most important role of finish in meat grading.

The evaluation of the degree of maturity is also an important consideration in the determination of meat quality. Maturity, as used herein, refers to the evidences of physiological age in the carcass or cut as distinguished from the actual age of the animal from which the meat was derived. The principal evidences of maturity are obtained from color, size, and shape of rib bones; ossification of cartilages, particularly the "button" on the end of the chine bone; ossification of the cartilagenous connections of the sacral vertebrae; and color and texture of meat.

Finish and maturity may be used as compensating factors in the evaluation of quality. Therefore, within certain limits, the Federal standards allow finish to compensate for advancing degrees of maturity.

By way of summary, excellent quality in meat, as evidence in the cut surface, usually implies a full, well-developed, firm muscle of smooth, fine texture and bright appearance containing a liberal amount of marbling and a minimum of connective tissue.

U. S. D. A. GRADES FOR MEAT

The following tabulation summarizes the applicable grades by class and kinds of meats for which the U. S. Department of Agriculture has issued official or proposed grade standards. Only beef, calf, veal, lamb, yearling mutton, and mutton are normally officially graded and grade stamped.

U.S.D.A. CLASSIFICATION AND GRADING SCHEDULE FOR CARCASS MEATS

Class or Kind	Grades
Beef (steer, heifer, cow)1/	Prime, Choice, Good, Commercial, Utility, Cutter, Canner
(bull and stag)	Choice, Good, Commercial, Utility, Cutter, Canner
Calf	Prime, Choice, Good, Commercial, Utility, Cull
Veal	Same as calf
Lamb	Prime, Choice, Good, Utility, Cull
Yearling mutton	Same as lamb
Mutton	Choice, Good, Utility, Cull
Pork carcasses - (barrows and gilts)	Choice No. 1, Choice No. 2, Choice No. 3, Medium, Cull

1/ Cows are not eligible for the Prime grade.

GRADING OF BEEF

Beef is graded on the composite evaluation of the previously mentioned two major factors -- conformation and quality. The student meat grader will find his job simplified by analyzing each carcass or cut in a logical sequence. The particular order in which the analysis is made is not of great importance, for several observations may be made simultaneously. However, a definite check list will prove useful. The following determinations should be a part of the analysis of grade:

(1) Class or kind of meat

(2) Sex classification (if applicable)

(3) Quality grade as evidenced by indications on the inside of the carcass.

(4) Grade on conformation

(5) Final analysis or composite grade

First, the class or kind of meat should be determined -- beef, veal, or calf, if from the bovine species.

Second, the sex classification should be made if important in that particular kind of meat, and it is essential in beef. The U.S.D.A. grades for steer, heifer, and cow beef are combined under one standard. Hence, sex classification as related to these standards is not usually important except that cow carcasses are not eligible for the Prime grade. However, a separate set of grade standards exists for bull beef and still another standard for stag beef. Therefore, the latter two sub-classes are shown as a part of the grade stamp on the carcass.

Sex condition or sex classification is an integral part of beef grading. The following definitions cover the major factors in determining the sex condition of beef:

> Steer carcasses are recognized by the typically rough and rather irregular fat in the region of the cod, the relatively small pelvic cavity, small "pizzle eye," a curved aitch bone, and the typical "bald spot" or lean area above the aitch bone.
>
> Heifer carcasses are identified by the very smooth fat in the region of the udder and a slightly larger pelvic cavity and straighter aitch bone than is typical of steers. As a group, they tend to be slightly more angular than steers and slightly less thickly fleshed.
>
> Cow carcasses are identified by their large pelvic cavity and nearly straight aitch bone. The udder is usually removed but when present is usually "wet," showing evidence of lactation. The hips are usually at least slightly prominent. The bones of older cows are usually hard and white and the cartilages on the ends of the chine bones are often completely ossified.
>
> Bull carcasses are identified by extremely bulging rounds, heavy crested necks, thick shoulders, and a large prominent "pizzle eye." The flesh is quite dark and coarse.

Stag carcasses usually have characteristics somewhat intermediate between steers and bulls. The typical stag exhibits slightly thick rounds, a slightly thick neck and a pronounced crest, a slightly large "pizzle eye," and in the cut surface the meat appears somewhat dark and slightly coarse.

After class or kind and sex condition have been determined, the next step is the evaluation of quality. This is determined primarily from the inside view of the unribbed carcass. Simultaneous with the observation of the inside of the carcass to determine class or kind (beef, calf, or veal) and sex condition, the degree of maturity of the carcass should be noted. Other quality indications of a carcass can only be evaluated after the degree of maturity has been determined. Carcasses from very young animals are characterized by soft, porous chine bones which terminate in soft, pearly-white cartilages. Rib bones are somewhat narrow and red. The sacral vertebrae show distinct separation, and cartilage is present on the split aitch bone. Flesh from such young animals is usually fine and smooth in texture and usually rather light in color. Carcasses from animals with evidences of advanced maturity or old age may have white, flinty chine bones with cartilages completely ossified, wide, flat, white rib bones, and complete ossification of the cartilagenous connections of the sacral vertebrae. The cut surface of the meat exhibits a rather dark color and coarse texture. A very advanced stage of maturity is often associated with a decline in thickness of muscling, increased coarseness, and irregularity of conformation and finish.

The other principal indications of quality in the unribbed side to be observed are the "feathering" between the ribs, overflow fat, fat covering over the skirt and flank, and the protrusion of fat between the chine bones; they are important primarily because of their association with the degree of marbling. The aforementioned indices of quality are useful in evaluating the unribbed side. In the event that "the book has been opened" by ribbing the carcass, the appearance of the rib eye is sufficient for evaluating quality factors other than maturity. Based on a consideration of all the factors affecting quality, you arrive at a quality grade.

The fourth step should be the evaluation of conformation. Actually an impression of conformation may be the first observation, but its final appraisal must be made with full knowledge of the class and sub-class. Conformation of the carcass should be determined from both the side and the back with the observation being made while standing 10 - 12 feet away from the carcass where conditions permit. Thickness in relation to length and depth is one of the major indices of conformation. Particular attention should also be given to development or fullness and meatiness in regions of the more valuable cuts -- loins, ribs, and rounds. The final evaluation of conformation should be in terms of U. S. grade - i.e., conformation equivalent to low Choice, etc.

The last and final step is that of deriving a composite grade to represent both quantitative and qualitative observations. This is, obviously, the most important step, and also the most difficult. The grade standards could not possibly indicate the balancing of the numerous combinations of characteristics that exist. They do, however, indicate by certain limiting requirements the relative importance of grade factors.

BALANCING OF GRADE FACTORS

The grade standards for beef reflect a difference in the relative importance of conformation or quantitative factors and quality considerations. For example, standards for the Prime and Choice grades emphasize the importance of quality in these two grades. The underlying theory back of this fact is that beef of these two grades is utilized largely by hotels, restaurants, and individual consumers whose major interest is the quality of the meat. Superior conformation which would result in a higher proportion of edible to inedible portions would not sufficiently compensate for a lowering of quality requirements for this group of consumers. Therefore, regardless of the excellence of conformation, a carcass must meet the minimum quality requirements specified for the grade to be eligible for Prime or Choice. Superior quality may compensate for deficiencies in conformation in the Prime and Choice grades on about an equal basis -- that is, a carcass with average Choice conformation and average Prime quality may be graded low Prime. Fortunately, there is a fairly high correlation between the excellence of conformation and of quality in beef carcasses. However, it is the exceptions that test the judgment of the grader.

As previously indicated, this application of compensating values between conformation and quality changes somewhat in the lower grades. The Good grade, and to an extent the Commercial grade, represents a segment of beef in which the usual consumer-buyer is still interested in a minimum level of quality but is becoming almost equally concerned with the quantitative consideration or ratio of edible to inedible portion. Therefore, the Good grade is the highest grade in which conformation superior to the minimum required is allowed to compensate for a deficiency in quality, and here only to the extent of one-third of a grade. This trend in compensation continues in the Commercial grade. In the Utility, Cutter, and Canner grades, conformation becomes increasingly important the lower the grade.

GRADING OF VEAL AND CALF

Most of the information on beef grading is directly applicable to the grading of veal and calf. The same general analysis is applicable to veal and calf except that sex classification is usually not a factor. Veal, calf, and beef represent different stages of maturity of the bovine species. Although the physical evidences of maturity in carcasses undoubtedly change slowly and very gradually, definite lines of demarcation must be established between veal and calf and between calf and beef. At the borderline between classes, the transition from one class to another has no influence on the final grade. For example, a carcass with characteristics indicating it to be strictly borderline between veal and calf should carry the same grade regardless of whether it is classified as veal or calf. Trade preferences for either veal, calf, or beef in specific areas are most pronounced and the correct determination of class is a very important but difficult part of grading. The most useful characteristics for determining class within the bovine species are color and texture of lean, character of fat, development and color of bone, degree of ossification of cartilagenous connections, and carcass size. These physiological characteristics are influenced by many factors, such as feed and management, and all may not be evident in a given carcass to the same degree. Hence, there will be some overlapping in certain factors, such as color of lean, between these three groups and the final determination must represent a composite evaluation of all factors.

Color of lean is the most important single factor in differentiating between veal and calf. Veal varies from very light pink in young veal to a dark grayish pink in veal showing evidences of maximum maturity. The flesh is usually soft and smooth and fine in texture. Veal has a rather soft, pliable character of fat, and the rib bones tend to be narrow and very red. Typical veal carcasses usually weigh under 100 pounds but if near maximum maturity they often weigh up to 150-175 pounds in the higher grades. Calf carcasses with maximum maturity for the class have a fine texture of flesh that is usually not more than moderately red in color, the rib bones have at least a small amount of red and only a slight tendency toward flatness, and there is at least a slight flexibility in the cartilages at the junction of the ribs and breast bone. In split carcasses the cartilages on the ends of the chine bones are entirely cartilagenous and the sacral vertebrae show distinct separation. Such carcasses are not noticeably "spready" or "barrelly" in appearance and their chilled weight, hide off, rarely exceeds 350 pounds in the higher grades.

Since veal and calf carcasses rarely have excessive quantitites of outside finish and frequently are deficient, it is necessary to emphasize minimum outside covering to a greater extent than in the grading of beef. Therefore, veal and calf carcasses have a decidedly lower percentage of fat than comparable grades of beef with a resulting influence on conformation requirements. Choice veal lacks the plump appearance of Choice calf and Choice calf lacks the fullness of Choice beef because of a lower proportionate quantity of fat. As compared with beef, veal carcasses in particular tend to be more variable in their relative development of conformation and quality factors. This is reflected in many veal carcasses being much more highly developed in quality than in conformation and is associated with the production of milk fat vealers largely of dairy breeding. Although this situation has no direct bearing on the formulation of grade standards, it does further complicate the grading. Veal and calf carcasses are normally graded in carcass form and the carcass is usually unsplit. Therefore, there is seldom an opportunity to view the cut surface of the meat. Such factors as texture, color of lean, marbling, and maturity will usually be evaluated in the unsplit and unribbed side.

BALANCING OF GRADE FACTORS

The official grade standards do not attempt to describe the numerous possible combinations of characteristics for each grade nor do they indicate a difference in relative importance of the factors in determining grade. In the actual application of the standards the compensation between conformation and quality factors is accomplished much the same as it is in beef. In all grades, quality in excess of the minimum requirements of a grade is allowed to compensate for a deficiency in conformation. This type of compensation is warranted to a somewhat greater extent in the higher grades than it is in the lower grades. The reverse type of compensation -- that of allowing superior conformation to compensate for inferior quality -- is conceded in only the Good and lower grades. The relative role of conformation becomes increasingly important the lower the grade.

The standards specify only one degree of fatness for each grade of veal and of calf. However, this degree of fatness applies only to carcasses of average weight and maturity. In order to qualify for any particular grade, heavier, more mature carcasses are required to have a somewhat greater quantity of fat and lighter, younger carcasses somewhat less fat than that specified.

GRADING OF LAMB AND MUTTON

Lamb and mutton are also graded on a composite evaluation of two major factors - conformation and quality. The same general principles outlined for the grading of beef, veal, and calf are applicable to the grading of lamb and mutton. The determination of class is the first step in the grading of lamb and mutton. The Federal grade standards recognize three classes which represent three distinct stages of maturity of the ovine species - lamb, yearling mutton, and mutton.

The sheep industry has rather well defined and generally accepted definitions for slaughter lambs, yearlings, and mature sheep in terms of actual age or as indicated by the stage of dentition. Determination of each of these three classes in the carcass is made on the physical evidence of maturity associated with the various age categories. Major emphasis is placed on the ossification of bone, color of bone, color of lean, and to a certain extent the conformation of the carcass. Classification of ovine carcasses is one of the most difficult phases of grading for there is often some overlapping of factors. The final determination of class must represent a careful composite evaluation of all factors. The following definitions may be useful in class determination:

> Lamb carcasses always exhibit the characteristic "break joint" on their front shanks and the break joint is usually moist, fairly red, and the "ridges" are well defined. The rib bones are usually narrow and show at least a moderate amount of red. Lamb carcasses are rather straight lined or regular in contour and have a light color and fine texture of lean.
>
> Yearling mutton carcasses may have either break joints or spool joints on the front shanks. They usually have moderately wide rib bones with only traces of red in the ribs and shanks. They often exhibit a slightly irregular contour with a tendency toward a "spready" or "barrelly" appearance. They usually have a slightly dark color and coarse texture of lean.
>
> Mutton carcasses always have spool joints on their front shanks and generally have wide rib bones that are devoid of red color. They tend to be somewhat irregular in contour and usually present a pronounced "spready" or "barrelly" appearance. The lean is generally a dark red color and is coarse in texture.

The Federal grade standards for the three classes of ovine carcasses are applied without specific sex identification. However, carcasses which show the heavy shoulders and thick necks typical of ram carcasses are penalized in grade in accordance with the extent of the development. Such discounts may vary from less than half a grade in carcasses from young lambs in which the characteristics are barely noticeable to as much as two full grades in carcasses from mature rams in which such characteristics are very pronounced.

BALANCING OF GRADE FACTORS

The evaluation and balancing of grade determining factors in lamb, yearling mutton, and mutton presents a slightly different problem from that in beef, veal, or calf. As in veal and calf, the grader will usually make his analysis of the unsplit and unribbed carcass and will rarely see the cut surface of the meat. Although the range in age within each of the three classes appears to be rather narrow, each class actually represents a rather wide range in maturity because of the rapidity with which ovines mature. That is, a lamb of maximum maturity for the class is relatively much more mature than a veal of maximum maturity. In order to place proper emphasis on this wide range of maturity, the grade standards for lambs specify two different levels of quality according to the degree of maturity. This principle of compensating increasing maturity with additional evidences of quality is basic to all Federal grade standards for meats.

Finish in relation to maturity -- especially distribution of finish -- is perhaps the most important part of quality determination in the grading of lamb, yearling mutton, and mutton. Although the Federal grade standards do not attempt to describe the numerous possible combinations of characteristics that are eligible for a given grade, they do indicate the degree of compensation between so-called quantity and quality considerations. The standards for both Prime and Choice grades place major emphasis on quality. Again, regardless of the superiority of conformation, a carcass must have the minimum quality requirements specified for the particular grade to be eligible for Prime or Choice grade. Superior quality may compensate for conformation inferior to the minimum acceptable for the grade on about an equal basis in both Prime and Choice grades. That is, a carcass with average Choice conformation and average Prime quality may be graded low Prime. This relationship changes slightly in the lower grades - Good and Utility - with conformation assuming approximately equal compensating value with quality.

SUMMARY

This discussion on grading has been limited to the classes or kinds of meats which are normally federally graded by the U. S. Department of Agriculture. Study of the official standards for grade for each class along with this information on interpretation of the standards should provide the student-grader with a visual picture of the grading operation. Proficiency in grading can only come from a thorough knowledge of fundamentals and intensive practice in grading under the direction of a competent instructor.

- - - - -

MR. PIERCE: Now, in this discussion we have attempted to outline the material that we think the student interested in meat grading should familiarize himself with on each class, before he goes into a study of the grade standards.

After discussing this with your committee last night, I think there would be some definite advantage in following up each discussion with a definition of the various grades. In other words, just the bare minimum material describing grades: prime, choice, good, etc. should follow each discussion on beef, veal, calf, lamb and mutton. Along with that, I think it would be highly desirable to use as many illustrations as possible. We have some illustrations here that we will be glad to make available. Most of these are in color. We have attempted to depict carcasses with minimum characteristics for the various grades.

We would suggest that the carcasses be of minimum maturity or rather the youngest eligible for the particular class, and those with maximum maturity for the class should be illustrated if at all possible.

We discussed this matter of colored photographs last night. I think it is coming up again later on.

That is all I will say about it except to say that we could furnish photographs of this type for beef, veal, calf, lamb and mutton.

MR. WALTERS: Thank you very much, John, for that fine report on what might be incorporated into this manual on the grading phase.

I think, inasmuch as it is desirable more or less to whip the loose ends together as we go along, we should throw the floor open for discussion on John's paper, and for those comments or suggestions which you have jotted down on your note pads up to this time. I am sure you have some good ideas to offer and, as I mentioned earlier this afternoon, those ideas we consider of inestimable value in helping this committee to put together the kind of a manual which you think we should have. Are there any questions or suggestions?

MR. MACINTOSH: In connection with the colored photographs, I should like to refer to the standard or standards published in December, '50, U. S. 11 Descriptive Terms for Marbling. Will it be possible to have colored pictures that depict those different stages of marbling? I think that is one of the problems confronting all of us, even those of us who try to do some grading in experimental work, that is, differentiating between those 11 descriptive terms.

MR. PIERCE: That is certainly a very pertinent point. As you people know, we have been working on this colored photograph business for two or three years, perhaps longer, and we have books of actual photographs out with our grading supervisors. Unfortunately, we have not been able to hit on a method of reproduction of these colored photographs that we consider satisfactory for general distribution. However, there is a film strip available, as you know, which I don't think is quite as good as the actual photographs but includes the same pictures.

In direct answer to Professor Mackintosh's question, I believe we have in these photographs, if we have so indicated, all the degrees of marbling that the standards mention. We have identified many of the pictures for our own use, that is, for use of the supervisors in terms of what the pictures represent as a specific degree of marbling. That could be made available to the same extent as you reproduce these pictures. In other words, that can be a consideration.

MR. COLE: While I am on my feet there are two things. One of them is in this book I should like to see something more specific in telling heifer from cow beef and cow carcasses other than generalities. I should like to see maybe some step by step methods, because I think there is not a contest that we have had that our boys haven't lost a point. They can tell a male from a female, but it is a cow from a heifer that gives them trouble.

Before I sit down I should like to say one other thing. The term "lard substitute" was used this morning, which I don't think we as meats men should tolerate. I don't think there is any substitute for lard, and I don't think we should use any such terminology as a lard substitute. Maybe we should say "lard and shortenings," but certainly not a lard substitute. I am of the school that thinks lard is a pretty good product and there is no substitute.

MR. PIERCE: On the first point he brought up, I am sure that it is worthy of a lot of study and effort on the part of all of us. Maybe it was a good thing I skipped over my definitions a while ago because perhaps they are not well accepted. Certainly they don't delineate too definite a method of distinguishing, I must say.

I will read them now, Bill, that you have nailed me to the cross on this, and if it does not do the job that you want, maybe it will help.

(Mr. Pierce then read his definition of a cow carcass.)

MR. PIERCE: I am sure that could be improved upon. Would you buy that definition of a cow carcass?

MR. COLE: I think you are speaking of a cow that is easy to identify. I am talking about a cow that is hard to identify.

MR. PIERCE: I know you are.

MR. BUTLER: We don't get that usual cow. That is the trouble.

MR. PIERCE: Well, steers, heifers, and cows are all graded on the same standard. Why worry yourself with it?

MR. COLE: Two points.

MR. PIERCE: Well, maybe that is one you can change in your contest regulations. I offer this definition not as a means of determining that unusual cow, but to see if you have any suggestions for improving it. I am thinking primarily that the boys who use this material will be interested in generalities, and it is up to you guys to teach them the fine points.

MR. BUTLER: There is one thing. We have been waiting a long time for these pictures. I am glad to know that we may be able to get them. But I am wondering if when you enclose them it would not be desirable to have at least a short discussion of each of the photographs, bringing out the points that you took the pictures to emphasize, because some times to the uninitiated it would not be very evident.

MR. PIERCE: That would be essential, I am sure. There would have to be appropriate legends.

MR. BULL: When you talk about pictures in this manual, are you referring to these colored photographs?

MR. PIERCE: Not necessarily. That is a determination this committee and conference will have to make. I merely mentioned that the pictures could be available if it was determined that they wanted to use colored photographs.

MR. BULL: It costs money.

MR. PIERCE: That is right. Perhaps good black and white pictures would do.

MR. SOULE: I should like to know, if this meat judging manual is accepted, when it is going to be available. Is it going to be available for this fall?

MR. WALTERS: We will have a few words to say about that just a little later. Are there other suggestions, comments, suggestions, or what have you on John's paper on grading?

If not, let's turn our attention to one of the big jobs, possibly one of the biggest jobs in putting a manual of this sort together, namely, that of providing for adequate illustrations of all kinds, whether they be sketches, free hand drawings, pictures, or any other needed illustrations along that line.

Bob Henrickson is going to say a few words with references to the problem that the committee is up against in illustrating this manual.

- - - - - - - -

(The discussion which followed on the meat judging manual is not included in this report. However, a copy of the discussion is in the hands of L. E. Walters, chairman of the Meat Judging Contest and Manual Committee, and another in the offices of the National Live Stock and Meat Board.)

MR. HENRICKSON: The committee is of the opinion that such material as you have seen in this volume, along with a more highly screened nomenclature for parts of cuts and parts of carcasses, with grading can possibly be available in mimeograph form -- and this I emphasize -- after considerable editing and reworking before September 1, '52. It will be quite an undertaking, but I feel, and the committee has expressed the opinion, that it will be possible to have it ready by that time.

On that basis, Bob, I think I will turn the meeting back to you. If this is information as to what you want, then this committee will do as instructed on getting the material further refined.

CHAIRMAN BRAY: Do I understand now, Lowell, that you have enough information from this group to go ahead with the general principles as you have outlined them?

MR. WALTERS: I think so, Bob.

CHAIRMAN BRAY: Do you want any form of approval on the part of the conference on the judging material that you have presented?

MR. WALTERS: I am wondering if we might include along with that the material on grading, with the understanding that appropriate illustrations for both sections will come along as was the expression of this group a few moments ago in the motion which carried by a majority.

CHAIRMAN BRAY: I think we appreciate the real problem that Lowell and his committee is up against here, and I think he has come forward with some very definite suggestions for progress. I personally think it is an excellent idea to have this in mimeograph form so that we can work with it during the fall, and possibly at International time some of us can get together and give you some final recommendations on how we think it might be changed. To get it into action is the best test. Following that, Lowell, it is your plan, then, to get it in published form? Is that right?

MR. WALTERS: It would be the wish of the committee to know your suggestions. The idea behind getting out this mimeographed edition this fall would be to give each of you time enough to kick it around and to digest it while you are using it. Does it work? Does it fit? Does it get the job done? If it does, then I think this committee is ready to go to work and get it in final form for it to be published. If, after having digested it thoroughly through and by its use in the coaching of your teams this fall, you say, "No, this isn't quite what we need, we need something else," then I think is the time for the readjustment of the plan in order to present most effecitvely what is needed in the way of the manual.

MR. MACKINTOSH: Mr. Chairman, knowing that there is a large demand, particularly on the part of our younger members, for some specific information to use as a guide in training judging teams -- I will not say anything about the ultimate end use of it, but for training judging teams, because we lack that material very much and there is a great need for something, I should like to make a motion that if it is possible this committee prepare in mimeographed form its progress report, I guess you might call it, for distribution to all the schools this fall. The individuals in those schools can then offer much more concrete criticism after trying to use it, and the committee will be greatly benefited because I am quite sure that anything we may prepare is going to require a lot of revision before it is put out in the form of a published text.

As a matter of fact, the first copy of most texts should be junked as soon as they are printed and only one copy saved for revamping. I think this mimeographed copy would serve such a purpose. Tom went through that process and I think it was a good one. I think we are going through the same process here, and I do not know how we can get it before a large group better than to prepare that mimeographed copy as a progress report for us this fall.

I should like to make that motion so they will have something to go on.

(The motion was seconded by several members.)

CHAIRMAN BRAY: I will try to simmer that down into a motion. You correct me if I am wrong on this. The motion is that the Meat Judging Manual Committee prepare in mimeographed form this judging material to be available for us this fall, and after using the material we then make suggestions to the committee. The motion was seconded. Any discussion?

MR. ZIEGLER: Who stands the expense of the mimeographing?

MR. WALTERS: Oklahoma A. and M. will stand the expense. Seriously, we will take care of that. We can take care of that end of it. It will be rather voluminous, but we will do it for the good of the cause.

CHAIRMAN BRAY: Thank you. (Applause)

Any further discussion on the motion? All right, you have heard the discussion. All those in favor of this motion signify by saying "aye"; opposed. (Carried)

Is there anything else that you have to have from this group at this time?

MR. WALTERS: I believe not, Bob.

CHAIRMAN BRAY: All right, let's move in next to the portion of the program which calls for suggestions for improving the meat judging contests, and because Lowell is the chairman of this committee, so closely associated with the Meat Judging Manual and Contest Committee, I am going to turn it back to him.

MR. WALTERS: Let's have a seventh inning stretch.

(Brief recess)

MR. WALTERS: Gentlemen, we are honored this afternoon to have with us a member of the National Live Stock and Meat Board, a man whom probably most of you know, Mr. John T. Caine, III, who is the General Manager of the National Western Live Stock Show in Denver. Mr. Caine, we are very happy to have you with us this afternoon, and we should like to hear from you at this time.

(Mr. Caine discussed the possibility of starting an educational feature at the Denver Show in the form of a stock judging contest to demonstrate carcass value. He pointed out the need for this type of work with the ranchman and asked the Conference for suggestions.)

MR. WALTERS: Thank you, Mr. Caine, for those remarks. I think the points you made are well taken by a group such as this.

According to our printed program we are to consider at this time improvements for our meat judging contest. I think that Mr. Caine brought out a cardinal point here, one to which we should all possibly give more thought. At least I am sure that I should. That is tying the meat a little closer to livestock production itself. It seems to me that in the final analysis in the work that we are doing on this judging, grading and identification manual, for example, we are doing a teaching job. We are not necessarily only coaching teams. We are building livestock men through the evaluation of the end product of breeding, feeding and management. There is certainly a point there that to my mind deserves a lot of consideration.

The floor is now open for discussion relative to the improvement of the judging contests related to this particular group.

MR. MACKINTOSH: I should like to ask Mr. Caine a question. On at least two occasions in the past this group has discussed the possibilities of a meat judging contest identical in nature to that held at several of the other shows in connection with the Denver Show. I do not know that the subject has ever been brought to your attention. I don't know that it has progressed that far. But what would the possibilities be of having such a contest at Denver?

MR. CAINE: We think we could have a contest like you have at the other shows at our show. It all depends upon the cooperation we can get from the packers, but we feel that there is a possibility of it. That is all right, but we think we ought to have something that would go further than just the students who are coming out there. I should like to get something educational for all those people who come to the show, trying to learn something about the livestock industry. That is why we would like to include if we can something that would be of value -- of a little more value to the rangeman and the stockman than the contest. The contest does wonderfully well for your students. It is fine. Just as our wool contest does, our stock judging, and all the others that we have.

I don't know all the details of it. Maybe we could combine the two, and have a little scheme at the National Western that is just a little different. Maybe we could combine something with your meats work. But if the group would rather have the straight meat judging contest there, of course, we can see what we can do on that. We might be able to do it.

MR. D. H. WILLIAMS: I was looking at Bob Bray and he was nodding to me to speak of a little device, Mr. Caine, that we have used in some of our shows at Wisconsin.

At our junior show, particularly at one a few years ago, we had what we called a carcass contest. This was with hogs. It could be conducted with beef calves just as well. In this contest inasmuch as we had about 20 counties participating we invited the county agents in each county to nominate a boy to bring in a barrow in this carcass contest. We had some special pens set up in the arena where these animals could be penned. Then we invited the exhibitors, the boys, the county agents, and everybody attending the show to take part in the contest.

Bob led off first of all with a demonstration of the new U.S.D.A. market grades of hogs, 1, 2, 3, medium and cull. He had some specimens of carcasses there and he went through the grades. Some times he had the live animals there representing each of the grades. Following Bob's demonstration we gave everyone at the show a score card and they evaluated these animals. I think we had about 15 animals the first time. The folks put a grade on every animal in the ring. They picked out those they liked best, that is, what they considered the top four or five animals.

The animals were then taken over to the packing plant and slaughtered. Bob, with his committee, graded them on the rail. Then they were brought back to the show the last day of the show, so that everyone who took part the first day could see the carcasses.

This little device has worked very well for us, Mr. Caine. We have continued it three or four years now. I think it could be done as well with beef cattle. We tried it with lambs last year and it worked out very well. With hogs it has worked exceedingly well with us as an educational device for the show.

MR. CAINE: That is just about the scheme that we have used. Two or three of the boys who are here who went through our old marketing school remember that we did that quite often. Our great friend, Bill Rennecker did a grand job of showing us all the different grades of hogs and then taking us over and showing us the carcasses and the cuts. That was a wonderful thing and the students -- we had 40 or 50 of them -- all enjoyed it greatly.

What is so difficult in a show like ours is to get some of those things before 10,000 people instead of getting them to only 50. The worry is how we can work it to advantage from an educational standpoint.

MR. WALTERS: Are there any other comments along this line?

CHAIRMAN BRAY: I think, Mr. Caine, that you ought to keep one thing in mind. That is, don't get the numbers too big in terms of livestock. Ten steers are probably just as effective as 20 or 25, because they can remember 8 or 10 whereas they cannot possibly remember each individual if you go beyond that number. If it is an educational feature, a smaller number is something that you should certainly take into account.

I think Lowell has brought up one of the things that we have talked about. I don't know whether or not Ed Kline is still our general spokesman on this subject. But we talked about this as a feature of one of our contests at the International. We have talked about having in addition to our regular meats judging contest another contest the day before our regular contest in which we would take our students into the yards and have them estimate the grade and yield of cattle, lambs and hogs. Then give them an opportunity perhaps the day after the contest to look at the carcasses, perhaps even grading them again and getting a combination score.

I think that possibility needs to be explored at this time. Ed, do you have any comments to throw in?

MR. KLINE: I don't know that I have much to say, Bob. You have kind of opened the subject up. There is one thing, as I think about this meats work. Years ago they used to teach farm butchering in the colleges. I think that we have kind of graduated from that type of education now, but at least in my classes I try to have the students correlate the live animals they slaughter with the carcasses that those animals produce. That is more or less our aim and our goal in teaching our meats work.

I think we are certainly missing a bet because of the students who go out from our agricultural schools, not too many of them will ever see four ribs lined up and place a class of four ribs or a class of pork carcasses, but every day those boys who engage in agriculture or in the livestock business are going to be looking at live animals, trying to picture the kind of carcasses those animals are going to produce. So I think it is time that we kind of bring our meats contest up to date and perhaps seriously consider the possibility of including a class, as Bob has pointed out, in which we take a few heads of animals and go over them quite carefully alive and then have a chance to see what those animals are like in the meat, because that is the contact that our boys are going to be continually having in their work when they leave school. I think it would be educational not only from the students standpoint, but also from the instructor's standpoint.

MR. NAUMANN: We have used this same plan that Ed has talked about the last two or three years in teaching our meats course. Also we have incorporated it into the block and bridal judging contest that we hold each spring. We have what we call a live hog evaluation contest. It is a requirement of the respective courses of the animal husbandry judging students and the meat students and they must participate. Of course, as a result of this some of our livestock men have learned a tremendous amount about the potential of a particular carcass. Some of their ideas have been changed rather radically, and we have all learned a tremendous amount. I think it is very practical.

MR. CAINE: Have you thought of any scheme by which we could do it at a show?

MR. NAUMANN: Well, I will say I don't know whether it would work at a show. It is very simple. A class of four animals that are rather radically different are picked. A fat one, a long one, a short one, a heavy ham bone, a light ham bone, and so on down the line. All those things are included in this class of four hogs. The animals are judged by these characteristics: Dressing per cent. Length of side. Back fat. Yield of ham. Belly. Loin. And New York style shoulders. Those are all placed 1, 2, 3, 4. It is just merely a placing.

Another consideration is the value of the live hog, on a per hundredweight basis.

They are all placed just as we do in our judging contest.

There are a tremendous number of possibilities, as you can see. I think there are eight or nine different placings and there are twenty-four possibilities in each placing, but it works out quite well. We have a few Joner's every once in awhile. Some of the hogs we pick don't turn out the way we expect them to by far, but we are learning a lot.

MR. D. H. WILLIAMS (University of Wisconsin, Madison, Wis.): An interesting thing in our Wisconsin work, Bob, is that, without selecting four of these particular grades, I don't think we have ever failed just the way the boys bring them in to get the 1, 2, 3 and medium.

CHAIRMAN BRAY: We get everything.

MR. OLIVER: You have been very fortunate. In connection with our state fair for several years we have had -- in fact, I say our state fair -- in our Oregon Swine Growers we had some before the last war. They would bring their hogs in which would be judged. We would generally have a program along with it, and the spectators would judge them. They were taken to the packing-house right there in Salem, and they would come back in two days and view the half carcasses and the cuts. The cut-out value would be there. They showed a lot of interest and it greatly improved the type of hogs that we are raising.

MR. WALTERS: Gentlemen, I hate to hurry us along but our time is drawing short. I am wondering if you folks are ready or if there needs be more discussion on the proposition which Ed brought up a moment ago. I think it has been talked about on several different occasions, and I am wondering if there is an expression which you might make at this time, one way or another, with respect to this particular kind of a contest or setup.

MR. PIERCE: I could not imagine a more appropriate time, since Mr. Caine has offered to start something new. Why wouldn't the Denver show be the place to inaugurate something new in the way of a contest with the type of work that Ed has discussed? I think it would fit in pretty well with what Mr. Caine has in mind for his educational purpose. It could also be adapted for the ranchers and stockmen out in that area and they could benefit from it as well as us.

MR. MACKINTOSH: I am heartily in agreement with the idea. A number of us have talked of the possibility for a long time, but we have always been confronted with the difficulty of keeping the students away from school to participate in the live judging and then holding them over a sufficient length of time to work on the carcasses. I am afraid we might get into administrative difficulties at the present time, particularly since the Association of Land Grant Colleges are sort of trying to clamp down on the time that students are away from formal classes.

I might also say at this time to Mr. Caine at the American Royal we have endeavored to have such a class for several years. I think possibly you are somewhat familiar with it. Ten hogs were shown in pens and five were slaughtered. Again our difficulty was getting those who should see the carcasses over to the packing plant to see the final results.

MR. CAINE: They had a contest of that kind here at the International, too, years ago, killing the hogs. The question of the length of time the students will be there is one of the worries that we have in all of our work, of course. If they could do the judging Saturday, when they do their other judging, maybe, or Sunday, and then get the carcasses back Tuesday, that would be about as fast as we could do it. That means, of course, that your boys would have to stay over at least a day longer than they usually do. We might be able to make it faster than that. We don't know. We have thought about it. We might have it ready so you could have it on Saturday and get the animals slaughtered Saturday and see them Monday.

MR. MACKINTOSH: If it was over early enough they could be slaughtered Saturday. Two factors are involved here. One is getting it over on time and the second is the killing.

MR. CAINE: You are right. That is our worry. That is one of the things that we would have to take into consideration, that is, to try to hurry.

CHAIRMAN BRAY: I should like to suggest that we try out at least at one of our major contests this year, either at Kansas City or Chicago, where there will be enough of us to see how it works. If some of us cannot hold our students over, we won't participate this year. But those who can, will participate and see what the possibilities are in it.

I can see the possibility of looking at the animals on Monday morning. You want your boys to look at meats Monday afternoon. Fine! But look at the animals Monday morning and then look at the carcasses Wednesday morning. That is holding them over an extra half day as it stacks up in my book.

MR. WALTERS: Is there any other discussion?

MR. KEMP: Why not have it on an experimental basis the first year instead of incorporating it into the rest of the contest? I think you would have to iron out how you will score and other minor details before adding it to the formal contest.

MR. WALTERS: As I understood Bob's suggestion it would be a separate thing anyway, I believe. Is that correct?

CHAIRMAN BRAY: Yes.

MR. WALTERS: Do you want a motion?

CHAIRMAN BRAY: I will make it in the form of a motion.

MR. KEMP: Second.

MR. WALTERS: You have heard the motion. It has been seconded. All those in favor will reply with an "aye"; all those opposed by the same sign. The motion is carried, and I will leave it to you to appoint a committee to go to work on it.

CHAIRMAN BRAY: All right, I was just going to say I would.

MR. WALTERS: Are there other suggestions or discussions that are on your minds that should come out at this time, before we turn the meeting back to our General Chairman? If not, I wish to express my sincere thanks to the members of my committee and to the others who have offered these timely suggestions for our help in putting together this manual on meat judging and grading.

I will turn the meeting back to the Chairman.

CHAIRMAN BRAY: Some time ago I had a letter from O. D. Butler, who is doing graduate work at Michigan State, informing me that one of our good friends, Lyman Bratzler, is not in good physical condition these days. In fact, he had, as I understand it, a slight stroke and some paralysis with it. He was our first chairman here and he did a wonderful job in getting the conference started off and getting the group divided into the various committees.

I wrote back to O. D., asking him for suggestions as to what we might do to show our appreciation to Lyman for his efforts in getting this conference started, and also to show our sympathy and hope for his speedy recovery. So at this time I am going to call on O.D. to talk to us a bit about that. O.D.

MR. BUTLER: Thank you, Bob.

I am very happy to report he has made considerable progress toward recovery. He can now walk fairly well with the aid of a cane and he has regained much of the use of his left side, and of his left hand and arm. His morale is good. He regretted having to miss this meeting. I went out to see him yesterday and I proposed that he give me his proxy to use here today, but he would not do it. He said he didn't think I know how to vote, and I agreed with him. But he gave me a few suggestions that we might bring up before the group.

I know that he told me to express the fact that his thoughts will be with us today and throughout the meeting.

CHAIRMAN BRAY: I am going to ask O.D. to prepare a resolution coming from this conference, expressing our sympathy and hope for his speedy recovery. Will you do that?

MR. BUTLER: I surely will.

CHAIRMAN BRAY: I should also like to have you and Ralph Soule work together, if you think there is anything further we ought to do, and if, after talking it over between yourselves and the rest of the group, you come up with some good idea bring it up tomorrow morning. All right, O.D.?

MR. BUTLER: Yes.

CHAIRMAN BRAY: Now we have a matter of business to bring up, and that is the election of a new Executive Committee for next year. As you know, this morning we appointed a Nominating Committee with Al Pearson as chairman. So I am going to turn the meeting over now to Al Pearson.

MR. PEARSON: Mr. Chairman and Fellow Workers: At this time we wish to submit names for your consideration for officers of the Executive Committee for the coming year. It is customary for us to have two carry-overs from last year's group, and today we propose that the carry-overs be Professor R. W. Bray and C. H. Adams. I think it will be necessary to have a vote of confidence in the carry-overs from last year's Executive Committee.

MR. KUNKLE: I so move.

MR. OLIVER: I second the motion.

MR. PEARSON: All in favor please manifest it by saying "aye"; opposed by the same sign, if there be any. (Carried)

In addition we have six names for nominations for new members of the Executive Committee. Each person has been handed a piece of paper and he will have an opportunity to vote for three of these six names.

The first one we have on our list is Professor R. L. Henrickson. Stand up, Bob, so everybody will know who you are.

Second, D. L. Mackintosh. Stand up, Davie. Everybody knows who you are, I know, but stand up.

J. W. Cole. Bill.

Lowell Walters -- L. E. Walters. I believe they have seen you before today, Lowell.

V. R. Cahill - Vern.

The last name on our list, J. J. Wanderstock -- Jerry.

MR. MACKINTOSH: Mr. Chairman, is it possible to receive names from the floor in addition to those which the committee has proposed?

MR. PEARSON: I understand it would be possible. Is that right, Bob?

CHAIRMAN BRAY: Yes.

MR. MACKINTOSH: I should like to propose the name of A. M. Pearson for the committee.

MR. PEARSON: I decline the nomination.

MR. MACKINTOSH: A lot of us have thought it over.

MR. PEARSON: I am a long way from the center of things to begin with.

MR. MACKINTOSH: That is why we need someone like you.

MR. PEARSON: We have a good southerner in Bill Cole down there. He was up north and he could not stand the cold winters and so he moved south. With this list, I feel that we have an adequate group. I feel that they are certainly worthy of our consideration, and I ask that each of you write down the names of the three persons whom you would select for officers on the Executive Committee of next year's conference. If you will do that our committee will pick up the ballots and count them.

(Balloting.)

MR. PEARSON: We will now turn the meeting back to the Chairman and go out and count the votes.

CHAIRMAN BRAY: Thanks, Al.

Now, to continue with our program, I just talked to Jerry and he indicates that an hour will pretty well take care of his part of the program. I hope you are all aware of the hard work that Jerry has put into this Research Review Committee project. Last year he made great progress in getting this project started. As I understand from what I have received by mail, apparently the machinery is now in action.

So we are going to call upon Jerry, as chairman to bring to you the current status of the Research Review Committee.

RESEARCH REVIEW COMMITTEE

1. J. J. Wanderstock, Chairman
   Cornell University, Ithaca, New York
2. T. N. Blumer, North Carolina State College, Raleigh, N. C.
3. James D. Kemp, University of Illinois, Urbana, Illinois
4. Wm. J. Loeffel, University of Nebraska, Lincoln, Nebraska
5. Thomas O. Meyer, State College of Washington, Pullman, Washington
6. Ellis A. Pierce, S. Dakota State College, Brookings, S. D.
7. L. N. Tucker, University of Missouri, Columbia, Missouri
8. M. M. Voegeli, Michigan State College, East Lansing, Michigan

MR. WANDERSTOCK: I am sure we will all get out in good time, because our committee has a very brief report.

The first gentleman who will present some of our results will be Bob Rust, taking graduate work at Michigan State College.

MR. R. E. RUST: The response to our request for abstracting to date has been this: We have fifty six people who are engaged in this abstracting work and up until yesterday we had a total of twenty-eight replies. That is, twenty-three of those replies have been in the form of a number of abstracts sent in. In fact, a total of 119 abstracts to date. That includes six that came in this morning. Two of these replies are from people who are unable to find any information relating to meats in the journals assigned to them, and three of the statements came from people who are unable to find the journals which were assigned to them.

The big question today is how we are going to get more response from the people who are doing this abstracting work, with only 119 abstracts in of the literature since 1946. You have all been given lists of the journals that are to be abstracted and I am sure they contain more than 119 articles. That is the question that we put before you today, and we would certainly appreciate suggestions from everyone here as to how we can improve this abstracting response.

MR. WANDERSTOCK: Are there any suggestions along this line? I might say that we have not been too well pleased with the response. We appreciate the cooperation of those who did send in abstracts. You will remember that I mentioned in the letters that I wrote that this is a cooperative effort and that in order to get the job done we will all have to take time out.

MR. OLIVER: How far back are we supposed to check?

MR. WANDERSTOCK: We decided to go back to 1946 eventually, and we wanted to try to get 1951 completed by today.

I should like to follow through on my previous question now and get the names of the new men who can do some abstracting. Marve, do you want to take down the names as the fellows shout them out?

Leonard, how about you?

MR. KAMM: Yes.

MR. WANDERSTOCK: Leonard Kamm. Anyone else on this side? Mr. Stouffer, and I have Mr. Breidenstein already, I guess. Mr. Young, are you in a position? Mr. Young, yes or no.

MR. YOUNG: No.

MR. WANDERSTOCK: Okay. Bob Deans. Anyone else? Merkel from Wisconsin. Briskey from Ohio. Kropf from Florida. Anyone else down this line? Fine! Thank you on this score, gentlemen.

As to the question as to which articles we should abstract or where we should draw the line with respect to abstracting, I have asked Marve Voegeli to handle that.

MR. VOEGELI: Thank you, Jerry. We hope we can satisfy the question, on what is to be abstracted. It has been a point of concern to those abstracting at Michigan State. We have had some rather heated discussions on just what we are to include and what we are not to include. We should like to get your opinion as to whether they will be of value to the meats men or whether we are just biting off too big a piece of work to handle efficiently. For example, how about nutrition points, such as feeding of ground beef, that is feeding it to women, or measuring the effect or processes of transfer of heat which might be applicable to work on lard rendering. I don't know whether we can use these or not. Is it applicable to our work?

I might run through some of these foreign abstracts which have been submitted just to see what the reaction of the conference is. This one is entitled, "The evaluation of surface Ph as freshness index for fish fillets." That is another question. Are we going to include fish and poultry? Are we going to restrict it to red meats.

MR. WANDERSTOCK: I think you ought to get a "Yes" or "No" on this.

MR. VOEGELI: Well, maybe you are right. What is the reaction to fish and poultry?

MR. DEATHERAGE: These questions it seems to me are pertinent in a sense, but I think there are more fundamental questions. Are these abstracts to serve a purpose for research workers or are they to serve a purpose for those in the meats field to keep them informed as to what is going on strictly in the meats field? I am thinking, for example, that the American Oil Chemists put out on annual review every year of what is pertinent to the oil chemists. There are two entirely different functions there. I don't think we can duplicate the efficiency of chemical abstracts or of nutritional abstracts or of the British or the Germans, which a research worker must of necessity go to. So I think the fundamental question is, are we going to abstract for the researcher or are we going to abstract meat articles for everybody to keep up a year at a time?

MR. VOEGELI: How do the members of the conference feel? Is it primarily meant for researchers or do we want to cover the field?

MR. KAMM: The researcher is going to want to look over his own research and not trust to articles that we abstract. I think this should pertain just to meat or otherwise you are going to get everything in the Biological Abstracts. You will have in the end just a duplication of that.

MR. VOEGELI: I think one of the purposes of this abstracting is to pull the loose ends together so that the research man has a source to go to for points pertinent to his research.

MR. KAMM: What advantage would it have over Biological Abstracts or Chemical Abstracts?

MR. WANDERSTOCK: It might have the advantage over Biological Abstracts of being more up to date, because, with due respect to Lyman, it does not include too many items. That is not his fault. Chemical Abstracts is rather difficult to use, especially if you want to pull out things on meat. I religiously go through Chemical Abstracts every two weeks and I have a terrible time pulling out meat items.

I should like to challenge Mr. Deatherage, too. With our system we want to try to get as complete a review of work on meat and work applicable to meat as possible, and we would like to get it out twice a year, if possible, so that we will have considerable information. We want to try to get it as complete as possible. We will leave out things, but I am sure we will pull in things that you might not ordinarily see in looking through Chemical Abstracts or Biological Abstracts or abstracts of that type.

MR. DEATHERAGE: Mr. Chairman, I don't think that is quite the argument. For example, say I want to know something about the spectrum of the different forms of hemoglobin. That maybe a very fundamental thing in meat pigmentation or color. But should it be in our abstracts? I don't think we can abstract it. I think we will have to go to the chemical abstracts to get that kind of information. For example, we are interested in determining hydroxyproline as an index of connective tissue. Should that be abstracted?

MR. VOEGELI: How do the other members feel about this?

MR. NAUMANN: I might be sticking my neck out here. I thought that the one basic idea behind these abstracts was to centralize much of the information on meats. Part of that is just merely results. I think another part of that would be methods. Whether it is the best method or not is somewhat beside the point. As to where you are going to draw the line as to whether we put it in the abstracts or not, I do not have any solution. I think, however, we should have fairly closely at hand a reasonably clear picture of the different methods that we might resort to in making a determination of one sort or another and I think perhaps the discussion in previous years would bring that out. We did have that in mind at one time.

LOGICAL
8441

MR. WANDERSTOCK: Do you think it would be possible to leave it to the discretion of the individual abstracter? I don't think we can put out a blanket rule and say that if it does not have the word "meat" in its title it cannot be included in our abstractions.

MR. VOEGELI: I think Jerry has probably just suggested what is the most workable means. Are there any other suggestions?

MR. KEMP: I should like to go along with Jerry's suggestion. I happen to be abstracting the Journal of the American Oil Chemists Society, and most of the articles in there are pertaining to lard or oils or something of that nature. If I just looked for the word meat I probably would not have anything, but I pick out the ones I think will be of benefit to some of us. However, I cannot do them all if they apply to nothing but cottonseed oil or something of that nature.

MR. WANDERSTOCK: Keeping in mind our abilities, time, and so on, we should try to keep as closely to meat as possible, and I think the committee feels that you should use your own discretion on some of the items in terms of the number of abstracts received this year.

Before we started on this Mr. Pollock asked me if I would estimate how many abstracts we would have every year. As Bob told us, we have at this date received 119 abstracts. I gave Mr. Pollock the figure of 400 or 500 a year. Of course, several of the journals which carry a lot of material on meat have not been abstracted as yet. So maybe instead of 119 the actual number will be much closer to my estimate. However, the National Live Stock and Meat Board, through Mr. Pollock, has indicated that it will be willing to back us financially to the tune of "four to five hundred abstracts a year." If we have the time individually to abstract the items which we think apply to meat, I am sure we can get cooperation in eventually putting the abstracts on cards and having them available at the various institutions.

I might just offer a few suggestions in terms of the abstracts as you fill out the form which we have provided for you. One item is "Date of coverage." We decided at the last meeting not to go back later than 1946. But we have received probably a dozen abstracts which go back -- I think the earliest one is 1929, which you will realize is wasted effort from our standpoint. I wish you would please write legibly or type the abstract. It is a rather difficult job occasionally to make out words. I made a cursory check of a number of them and there are misspellings in authors' names and mistakes in paging, and some times the grammar gets a little mixed up. It is actually easier for you to make the corrections on the ones that you are abstracting than for our committee to go over them and make the corrections. So if you will please check those things before you send the abstracts in to us, we will be very appreciative.

Also will you consolidate the results, instead of, as I have noticed on a few abstracts, just copying verbatim the summary that appears in the paper or the bulletin, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and so on? We would appreciate that, too.

You will remember that last time we decided we would like a system using McBee cards.

These are the McBee perforated cards. There are holes on the four sides of the card. One corner of the card is cut, so that when we get a bunch of cards we can just pile them like this. If we get that cut corner on one side, we know we have all the cards right side up. We don't have to worry about what we do with them. We can shuffle them all around. I have a few blanks to make it a larger bunch of cards. I have put abstracts on some of these cards. This one happens to be Dick Wheeler's abstract. The title is on here. All of this information was contained on the abstract form that Dick Wheeler filled out. That is true of the 15 or 20 that I have. The complete information contained on the abstract form is on these cards. Some times we had to go over on the other side.

Then we made an index in line with the subject-matter classification that we drew up the last time and approved. Each hole represents a subject. This hole is antioxidants. Armed Forces bacteriological studies, and so on.

MR. WANDERSTOCK: The last thing we want to discuss very briefly, and then we will be finished, will be discussed by Ellis Pierce of South Dakota.

MR. PIERCE: Thank you, Jerry.

The first point is, do we have any new periodicals which we would like to add to our list of periodicals which we are abstracting? In other words, what recent publications have been put out in periodical form that we should add to our list of articles to be abstracted? That is a question that you probably can't answer right now. But when you get home and get to looking through your publications again the committee would appreciate it greatly if you would let them know if there are any periodicals that we should add to our list. You each have a copy of the list of periodicals which we are abstracting at present. If you have additional periodicals to add to that list just drop the committee a short note listing the periodicals and we can add them to our list.

The second point which we would like to discuss is a little more pertinent at this time and it is one on which we hope we can get some action. That is, when and how often should the abstracts be issued. In that connection, especially the how often part. It is the feeling of the committee that we would like to issue these abstracts on a bi-yearly basis. In other words, twice each year. The question we would like to have the answer to is when should those issues come out? On that I would like to have suggestions from the floor. If any of you have ideas on when they should be issued I would like to have your suggestions. It isn't necessary that we decide it right at the present time. If you want to think this over for a period, I am sure that any written suggestions coming to the committee will certainly be given the consideration that any suggestions from the floor will be given now.

MR. WANDERSTOCK: Tentatively we think we would like to issue them twice a year. July 1, let's say, and January 1. If any of you have any suggestions we will be very happy to have you drop us a line relative to time and frequency. If not, and knowing the outcome of a situation like this, we will proceed on the basis of the judgment of our committee and I know that you will support us in that approach.

Professor Loeffel, who is on our committee and who could not be here, made the point in his suggestions that we should keep up to date on this, because once you have let it drift by a while you will find that you have an awful lot to do to catch up if your particular publications contain many articles on meat.

Thank you very much and we will be very happy to get any suggestions from you and we will be very pleased to have you send us abstracts.

CHAIRMAN BRAY: Thank you, Jerry. As I was sitting there I could not help think of the amount of work that one man has put in on this project already and what little work some of the rest of us are putting into the project. I think I was fortunate in having some journals that did not have too much in them. But at any rate, four or five journals to go over every year does not seem like a very big task.

Now to get along here, I think we ought to have a report of the Nominating Committee. Al Pearson.

MR. PEARSON: The final duty of this committee is very short. We have counted the votes and the additional members of the committee are Lowell Walters, Bill Cole and David Mackintosh.

I thank you, Mr. Chairman.

CHAIRMAN BRAY: Those three new members deserve a hand. (Applause) The new Executive Committee is to serve as the Resolutions Committee and I have a list of resolutions that are to be made that I will hand over to Lowell or to somebody on the Executive Committee.

(Announcements and taking of picture.)

CHAIRMAN BRAY: We will adjourn our meeting now and we will meet back here at seven o'clock sharp.

(The meeting adjourned at 5:00 o'clock.)

# # #

TUESDAY EVENING SESSION

JUNE 10, 1952

The meeting was called to order at 7:10 o'clock by Chairman Bray.

CHAIRMAN BRAY: Let's get started, shall we, gentlemen?

Mr. Howard Ford has been chairman of the Extension Committee in Mr. Snyder's absence and has set up the program. Since he cannot be here, he has asked Mr. Francioni, from Louisiana State University, to act as chairman for the committee. At this time I will turn this part of the program over to Mr. Francioni.

EXTENSION COMMITTEE

1. R. W. Snyder, Chairman
   Texas A. & M. College, College Station, Texas
2. Paul Brown, Louisiana State University, Baton Rouge, Louisiana
3. James Christian, Pennsylvania State College, State College, Pa.
4. Howard G. Ford, Extension Service, Little Rock, Arkansas
5. J. B. Francioni, Jr., Louisiana State University, Baton Rouge, La.
6. W. L. Richmond, Mississippi State College, State College, Miss.
7. K. F. Warner, U.S.D.A., Washington, D. C.
8. George H. Wellington, Cornell University, Ithaca, New York

MR. FRANCIONI: Chairman Bray and Fellow Co-Workers: It is very gratifying to me that after twenty years of teaching I am still considered an extension worker. The Extension Committee, as you well see, is curtailed a great deal. We think that the absentees, however, are not AWOL because I have letters from them assuring me that they are doing such a good program out in their respective states they cannot possibly be here. However, those of us who are here are going to attempt to give you as good a program as we possibly can.

(Remarks off the record.)

You who are in the teaching end of the research field please don't be too hard on the extension workers. Their absence, of course, is no indication of their interest in the work. You must also remember that the extension people are your salesmen. They sell your merchandise. Another thing about the extension worker -- don't forget that he is an ambassador of good will and he is really the public relations man for the university.

I think the research workers and teachers should stand on the stool and see the whole entire field of the extension division. From the seriousness that I have seen here this morning, I can see a great future for the field.

So, fellow co-workers, with those few remarks I now take great pleasure in presenting to you the first speaker on the program Mr. D. H. Williams of Wisconsin. Mr. Williams I believe is not a newcomer to the field but he is certainly a newcomer with us. Mr. Williams.

MEAT ANIMAL PRODUCTION FOR THE CONSUMER

D. H. WILLIAMS
UNIVERSITY OF WISCONSIN

The consumer of meats, expressed most properly in the feminine gender, at least as far as purchasing of meats is concerned, is today perhaps more critical of the product she buys than ever before in history. This has come about through consumer education work, through self-service markets, and through enlightened meat merchandising programs. In selecting meat buys which will give the maximum return in edible meat per dollar spent, the housewife is becoming better informed year by year. She is responsible for some of the new trends in meat production.

There is at the present time a challenge to the meat industry in the fact that our human population is increasing much more rapidly than are our livestock numbers. Consumers will be forced to turn to other sources of meat or protein food if we cannot produce enough meat animals to meet nutritional requirements.

Will our meat production program take on new aspects? Will the feedlot give away, at least in some degree, to lower cost pasture production of beef? Will the desire for "red meat" lead to feeding practices which put on the market an even higher percentage of animals below the grade of prime?

Meat animal education activities in Wisconsin have followed several lines of activity. The work carried out through the Extension specialists' program to the counties, winter meetings, farm demonstrations, and individual farm talks have been ways in which this project has been continued.

Some special activities that we feel have effect in bringing more information to farm youth and adults regarding meat animal production are:

I. Carcass Contests

II. Meat and Carcass Displays

III. Identification of Retail Cuts

IV. Judging Contests

I. Carcass Contests Considering first the carcass contest activities. These have been set up for youth meetings as well as adult educational work. To-date, most of our carcass work has been done with hogs, and to a much more limited extent with lambs and beef. These contests have been conducted at our four Junior Livestock Shows in the state, as well as at many winter meetings and at our spring market show.

This is the general plan for our carcass contest. Entries in the carcass contest are brought to the show on the first day, and placed in special pens where those attending the show can examine them readily. On the morning of the opening day, demonstrations are presented using carcasses of the various grades as well as live animals in demonstrations presented to exhibitors and spectators attending the show. Professor R. W. Bray has given valuable leadership in helping to set up these contests and presenting these demonstrations. Immediately following the demonstration, those attending the show are given the opportunity to look over the live animals entered in this carcass class. Score cards are filled out which allow the contestants to place a market grade on each of the animals, and at the same time pick out their choice of four to six animals. The animals are then taken to a packing plant, slaughtered and the carcasses graded on the rail according to a score card developed by Professor Bray.

On the last day of the show as many as possible of the carcasses are returned to the show for the benefit of the exhibitors. Winning entries are announced.

These contests have proven to be very well received on the part of both adults and juniors. We feel they serve a real educational purpose in meat animal education. Certainly it gives producers a better understanding of live animal carcass relationship.

During the past season, we carried out a similar carcass contest with lambs at one of our shows. While the story lambs present is not quite as dramatic as that of pork, the contest was well received.

Many of our breeders and Extension workers in the state would like to conduct the same kind of contest with beef. To-date, we have not been able to set up the work because of the greater cost of conducting the contest. Last fall, however, following one of our junior shows, a group of exhibitors and breeders was invited in to one of the packing plants where three buyers for chain meat markets had appraised the carcasses of the animals purchased from the junior show. It was interesting to note that the buyers' unanimous selection was for the choice grade and the lower end of the prime grade with a very emphatic refusal of the over done primes. They were quick to point out that the highly finished primes would be discontinued as far as their outlets were concerned.

Perhaps our junior shows could be set up in such a way as to give proper emphasis to the exhibitor who does a good job in fitting out livestock to the most acceptable grades. This, I believe, would be most desirable from an educational standpoint.

II. Meat and Carcass Displays For the last number of years, the Wisconsin College of Agriculture has been using a walk-in type of display case, 16 ft. long, 8 ft. deep, and 8 ft. high for doing educational work with meat cuts and meat carcasses both from the standpoint of producer education and consumer education. This display case has been used in Farm and Home Week demonstrations at the College of Agriculture, the State Fair, at our junior shows, at our spring market hog shows, as well as at some of the special livestock events in the state. This type of display has served very well in pointing out to producers and consumers alike, such consumer preference. This display when presented at the State Fair attracted many of the thousands attending, and perhaps was the start of consumer education work in meats at the College of Agriculture.

III. Identification of Retail Cuts of Meats On the theory that producers and consumers alike should first of all be able to identify meat cuts, a portable type of display was built which could be moved from town to town easily. Built in the form of a rotating showcase and mounted on a trailer, this equipment has served to create interest in a meat cut identification contest which has been used at the Wisconsin State Fair, Junior Shows, Farm and Home Week, as well as at the state and county livestock meetings. Both youth and adults have shown real interest in this contest. It has been used with both producer and consumer groups. We feel it has helped to stimulate interest on the part of both towards a better understanding of each others needs and problems.

IV. Judging Contests Judging contests at our Wisconsin Junior Livestock shows has been conducted along the lines of market grade identification work. Feeling that the conventional 1,2,3,4 placing of livestock is being adequately handled in other events, the junior show judging contests have been set up to better educate those in attendance regarding the market grades of hogs, beef and lambs.

The procedure is about as follows: All those taking part in the contest are shown representative animals of the various grades together with live weights and live prices per hundred weight. The contest itself is then put on by asking the contestants to identify unknown animals as to grade, weight and price. We have found packers and livestock handling agencies most cooperative in helping to put on these demonstrations.

It is important that producers and consumers be kept informed of trends in the meat animal industry. We have found the above activities useful first of all in keeping producers informed as to the trends in consumer demands, and to a more limited extent, in bringing to the consumer some of the problems confronting the producer. It is hoped that these activities will lead to a better understanding between producer and consumer - will lead the producer to study the use to which all of his meat products must ordinarily be put, and at the same time to develop a meat animal program that will be most profitable to the producer with maximum efficiency in producing these important products for Americans.

- - - - -

MR. FRANCIONI: Thank you, Mr. Williams. We certainly appreciate the trend that you have given us.

The next speaker on the program is a real freshman among us. In fact, he is still an extension handyman. He has connected with Purdue since January. So he has a whole lot to learn yet. But I am sure that after he has had a little more experience he will be one of the finest workers we have in meats.

I now take great pleasure in presenting to you one of my friend Kunkle's boys, Mr. Young from Purdue.

# # #

PURDUE MEAT MERCHANDISING PROGRAM

J. E. YOUNG
PURDUE UNIVERSITY

The need for a meat merchandising program is great and a Program is wanted by the retailers. Extension has had programs for the producers, packers - many of whom have their own research and schooling, and the consumer, but little has been done for the retailer. The large chains have schooling and training for their own personnel and the small independent retailer has had very little. Extension is a way to perform the job - of bringing to these retailers better methods of meat merchandising. In 1951 Purdue conducted a survey in Indiana titled "Retailing Meat in Indiana," it was this paper which led to the organization of the meat program. A need for as well as a desire for, a meat merchandising school for retailers was expressed by 86% of the retailers contacted.

As to what was actually needed in the presentation of such a school, this too could be taken from the survey. Many retailers stressed in the survey what they needed or wanted to be contained or taught in a meat merchandising school. Some of these items wanted in a meat program were:

Cutting Techniques and Methods

Cutting Tests

Pricing

Displaying

Special Merchandising of Slow Moving Cuts

There were the more important items that the retailers thought they needed. Of course, these are enough and you could spend an unlimited amount of time on each of these and still not arrive at a final answer.

Using these needs as a guide in organizing material it was a fairly simple process to bring together the subject matter for the school. From the survey other matter was found to be necessary besides what the retailers requested. Therefore information other than that requested by the retailers was included in the subject matter.

Before actually giving you the subject matter I want to relate some of the sources of the information needed. Some of these were:

Swift and Co. Merchandising School - Much help was received here as points to be included in general meat department operation and ideas for a merchandising school.

NARGUS - Many of their publications were used in gathering meat department management information.

National Livestock and Meat Board - This group furnish valuable information as to actual cutting techniques, pricing methods, and better methods of merchandising the slow moving cuts.

U.S.D.A. Bulletins - Information concerning grading, pricing and cutting methods.

In our teaching it is necessary to speak in terms of profits to the retailers, but we must think of Miss or Mrs. Consumer and have the retailer give her a better product. There has been a lot of effort to keep the quality through the production and processing stage, but all is lost unless it is maintained by the retailer. From this collecting of what was needed and then the information itself here is the meat school and what it contains.

BUYING AND HANDLING - Information is given as to what to think about when buying. The retailer's, customer's needs and wants - inventory - supplier and quality.

TOOL HANDLING - A sharp knife is essential for successful meat cutting. Although not directly considered a profit making device it may aid in making a more desirable product in turn giving Mrs. Consumer a more desirable product and finally increased sales and more profit. Power, equipment donated by the Toledo Scale Company is also used, safety and cutting are stressed.

METHODS OF CUTTING - There are many different ways and means of cutting meat, probably a different method for every retailer. There are though, a few standard methods which meat cutters follow varying in order to meet their specific needs. To say that there is one and only one way to cut up a side of beef would be a foolish statement. In the meat schools we follow the cutting procedure outlined and recommended by the United States Department of Agricultural Grades and Standards Department.

During a school we cut up into the retail cuts the following meat items - side of beef, 2 small 12-14 lb. hams, 1 large 16-20 lb. ham, and 2 or 3 8-10 lb. pork loins. Lamb and veal were not included in the school because very few retailers in Indiana handle them, however arrangements are made to include them when needed. This is not a great deal of meat to cut up for a class of this type, but we not only cut the meat but we discuss other variation or methods of cutting along with running cutting tests.

PRICING - There are several different methods of pricing -- percent of selling price, percent of cost and cents per pound. Any one of these methods has its merits for deciding how much the retailers are going to make on a side of beef or a ham, but from one side of beef the retailer has any where from 15 to 20 different retail cuts of meat--steaks, stew, roasts and etc.--and each one of these usually commands a different value. Because of this great number of cuts from the one wholesale cut, a retailer must make cutting test, in order to determine the proper value for the cuts, to ensure profit and still meet competition. If his initial cutting test does not give him his desired profit or does not meet competition, he must either vary his method of cut or alter his prices.

DISPLAY - This is also an important part of meat retailing, properly displayed items sell faster than the haphazard display. Because of the perishability of meat items, we have adopted display boards, which serve to bring out the principles involved in a well planned display.

SALESMANSHIP - A discussion of points to think about in selling. What type of customer are you waiting on? Do you know him or her personally? Is your personal appearance neat and clean? In this school we feel a strong selling point is method of preparation. If the retailer knows how to cut it he should have some idea of how to prepare it. In our meat school we include a session on cooking and actually prepare a cut of meat.

The above summary gives you a brief idea of what is contained in the meat school. Many of the topics discussed in this paper are combined in the conduction of the school because of convenience and lack of time. Schools are conducted in a classroom trailer requiring one day for completion or two night periods for completion. Classes are held to a minimum usually 10 to 15 people so that there is class participation and informal discussion. A meat handbook is also handed out to the retailers, containing information covered in class and other material not covered in class.

The program doesn't stop with the classroom, but we make call-backs, going back to the retailer and help him with his special problems. Also a newsletter is published monthly called the "Purdue Retailer," which contains information about new merchandising methods.

Grocer clinic and consumer clinics are held throughout the state in order to keep the interest alive. The research department at Purdue is working very close with the program to give us any valuable information which will improve our school and retailing. As everyone knows this is the job of extension, to translate this new information of research into a form understandable to everyone concerned.

- - - - - -

MR. FRANCIONI: Thank you, Jim. I know we are all interested in what you had to say about your meat school on wheels. I am sure it is something new to most of us. We had never thought of it, I am sure of that.

Next on your program you will find the topic, "Work Plan for an Extension Meats Program by Regions of the United States," panel discussion by the committee.

The committee refuses to discuss it and we are going to open it up for discussion by the entire group. Of course, I could read all the written plans that I have in my possession but I doubt if you folks would be very much interested in that.

I do want to say that a good meats program can easily be planned if you will sit down and attempt to answer four questions that I heard Ken Warner mention several years ago.

Ken suggested that to analyze a situation and determine the needs and wants of the people who are vitally interested there are four questions that each and every one of us should answer. First of all, what is the situation? Secondly, why? Thirdly, what should be done? Fourthly, why has it not been done by now?

There may be some specific questions that you would like to ask Mr. Young, Mr. Williams and myself. So will you come up here, Mr. Williams and Mr. Young?

MR. WILLIAMS: May I ask a question of Mr. Young first of all?

MR. FRANCIONI: Mr. Young, suppose you come up here where we can all see you.

MR. WILLIAMS: This is the question that I have. I am wondering to what size cities you are carrying meat educational work.

MR. YOUNG: We don't confine it to any size city.

MR. MACKINTOSH: What is your source of procurement and what are your methods of disposal of your products?

MR. YOUNG: Well, as I said, this wholesaler has been supplying us with our product, the whole supply, one wholesaler and his salesmen have sold it prior to the school or we sell it right there in the school, either one. We are setting up a committee now in Shelby County and we have asked the local packers to come in. We have two of them on our committee and they have been more than glad to supply us with our meat.

MR. MACKINTOSH: Then the wholesaler stands any loss that you might have. For instance, you mentioned cooking certain cuts.

MR. YOUNG: We cook flank steaks, so I don't think there is too much loss.

MR. FRANCIONI: Any other questions?

MR. BUTLER: What department is sponsoring this program?

MR. YOUNG: The agricultural Economics Department.

MR. BUTLER: How is it financed?

MR. YOUNG: It is on matching funds through Washington. The money is supplied by the state and matched by Washington. I cannot tell you the amount, sir.

MR. BUTLER: Do you have any other meats work at Purdue?

MR. YOUNG: No.

MR. A. M. PEARSON: I should like to ask if any of you in extension work have had any large amount of experience in freezer locker and curing schools.

MR. FRANCIONI: We tried them in Louisiana for about four or five years and they were very successful. But we find that our food and locker plants are gradually going out of the picture at this time.

The way we function is to hold special schools and clinics at those various community centers. In this way we have been able to maintain a very good program of meats in Louisiana, where we take the entire setup from slaughtering down to quick freezing. Starting today at the university we have brought in about 82 of those school managers who are there for three days, to learn the newer wrinkles that we have found out about food preservation at the school preservation centers.

Are there any other questions?

MR. RUST: This is a question addressed to any of the three gentlemen. Just where do you think the emphasis should be placed in the meat extension program? At just what level? It appears pretty difficult for one man to be able to administer an extension program at the producer level or factory level, consumer level, or retailer level. All four of these levels together. At which one of these levels do you think our emphasis should be placed?

MR. WILLIAMS: I think a good place to start any one of these programs is with the youth. You can certainly stimulate some interest among all the farm folks, and the packers come along. For example, this youth work that we have been doing at Wisconsin. As you probably know it is carcass work. The packers supply the animals and pay some premiums to stimulate interest on the part of the boys. The parents and other folks attending the shows can see the results of it and can even take part in the estimating contests, as I mentioned.

I think if we are looking for a place to start, it might be well to go to some of the junior shows, to some of the youth work and thus involve all four of the groups that I mentioned.

MR. FRANCIONI: Of course, each state has to solve its own problems, but we find that we can stimulate interest in meat even when we give a chalk demonstration at our shows and fairs. We certainly cannot overlook putting in a good plug for meat even in a chalk demonstration.

MR. BUTLER: One more question of Mr. Young. Is there a fee for these courses?

MR. YOUNG: I was just going to mention that. There is a fee attached to the program, a fee of $10 per store, and usually for from three to five persons, and that allows them to come to all three schools. So that partly pays the way.

MR. BUTLER: They also take a little more interest.

MR. YOUNG: That is right. We have felt that there is a little more interest on the part of the retailer if he has to pay for something than if it is free. I think we are the only state that has a fee attached to any merchandising program. There are some other fruit and vegetable programs which don't have the fee attached.

MR. FRANCIONI: Are there any other questions?

If not, you folks have been very attentive and very kind.

CHAIRMAN BRAY: Thank you, Mr. Francioni. In spite of your shorthandedness here, I think you have given us an excellent program this evening.

This concludes our evening program. The meeting stands adjourned until eight-thirty.

(The following four papers on Meat Extension Work Plans were submitted before adjournment to the Conference)

# # #

ARKANSAS EXTENSION SERVICE

HOWARD G. FORD - EXTENSION MEATS SPECIALIST - LITLE ROCK, ARK.

Plan of Work

Farm Meats

Division of Specialist's Time: Meats, 80 per cent
Swine, 20 per cent

(1) Situation

Until recent years farm families have had to depend almost entirely upon winter weather for processing of home-raised meat animals. This resulted in cured pork products making up the largest per cent of farm meat diet.

During the last ten years increased development and use of freezer locker plants has resulted in use of a greater variety of meats in the diet. They have been a big factor in eliminating the short winter period as the time when most fresh meat supplies are available. During the last three years, large numbers of home freezers have been purchased by farm families. They are starting a trend toward consumption of more farm-raised meats - particularly beef.

There is a definite need, however, for continued improvement and expansion of locker plant facilities. Of the 112 locker plants in the state, only about 50 per cent are providing services which are convenient and economical for farm families. The locker industry as a whole is undergoing a change. The trend seems to be toward development of locker plants as community freezing centers. Renting of lockers may then become a minor phase of operation. On the whole, locker service in Arkansas is about average with that of other states.

Two major problems in meats at present are inadequate number of custom slaughter plants and no satisfactory answer to the problem of storing cured meats.

(2) Problems

Arkansas farm families have many home meat handling problems:

(a) Lack of chilling and cold storage facilities for handling an adequate home meat supply.

(b) The use of too much salt in curing meat.

(c) Spoilage in fresh and cured meat.

(d) Unsanitary slaughtering with inadequate facilities.

(e) Improper cutting with great waste.

(f) Unsatisfactory storage of cured products and frozen products.

(g) Use of low quality meat in freezer lockers.

(3) Long-Time Objectives

(a) Provide opportunity for chilling and storing a home meat supply for every Arkansas farm family.

(b) Improve cutting and curing practices on farms and in meat curing plants.

(c) Improve cutting practices to allow families to obtain more wholesome meat meals per carcass.

(d) Improve slaughtering and chilling facilities at meat processing plants and on individual farms.

(e) Improve storage of cured and frozen products.

(f) Encourage use of more finished beef and lamb in freezer lockers.

(4) Annual Goals

(a) Locker operator, Extension agents, and leader training meetings - 30.

(b) Beef cutting demonstrations - 10.

(c) Pork cutting and curing demonstrations - 20.

(d) Carcass type demonstrations - 3.

(e) Slaughtering demonstrations and meetings - 10.

(f) Meat wrapping and storing demonstrations - 5.

(g) Home meat supply planning meetings - 20.

(5) Plan of Action

(a) Encourage agents to help develop farm meat handling services, particularly slaughtering service rendered by freezer locker plants.

(b) Plan and assist county Extension agents with locker service improvement demonstrations - June, July, and August.

(c) Assist with five county home raised beef demonstrations using freezer locker merchandising of carcasses, halves, or quarters to help pay feed costs - October and April.

(d) Assist five agents with 4-H meat curing demonstrations.

(e) Assist agents with two-day on-the-farm pork slaughtering and curing demonstrations - November, December, and January.

(f) Assist eight county Extension agents in training 4-H Club members in meats identification and judging. Locker plants will serve as training centers.

(g) Assist Negro agents with ham and egg shows - March.

(h) Work with the Arkansas Frozen Food Locker Association to improve coordinated locker service in the state.

# # #

A DIGEST OF SUGGESTIONS TO CONSIDER IN PLANNING AND PUTTING INTO ACTION AN EXTENSION SERVICE MEAT PROGRAM

J. B. FRANCIONI, JR.
LOUISIANA STATE UNIVERSITY
AND
A. AND M. COLLEGE

The most that can be hoped for, and all that is intended in the remarks to follow, is to present a picture which from its substance may invite general interest in a renewed effort to make the Extension Service meat activities enduring and satisfying to the basic needs of those who participate in them.

Long observation, from a vantage point in the deep South, has convinced me that in many states in the area the Extension Service meat activities have not met all of the long existing, as well as, some of the new challenges to the fullest extent. Without question there are other sections of the country that are in a similar situation.

While great strides have been made in the "yesterdays," we are far from having exhausted all the possibilities of having rural, as well as urban families, adopt food preservation practices in keeping with the knowledge available -- old and new. Factual information discloses the fact that the number of households engaging in the meat programs is insignificant compared with the total over-all number of families in each respective state. The opportunity to assist urban families is, in a sense, a new and added challenge that cannot be ignored, and should be exploited to the fullest extent because the field is comparatively new and most promising.

Alarming as it may seem, to some of us, the situation can easily be corrected by effective Extension teaching in selling to the people the all important fact that it is a good business never to allow recognized practices to lag long behind the knowledge available and of proven value. A good meat program should, by necessity, embrace the whole range of recognized and approved practices if urban and rural families are to have anything approximating a satisfactory living with economic implications, plus maintenance of good health through better nutrition.

Though many State Extension meat activities are well organized and have definite objectives there is still room for improvement and expansion. This is especially true in the South, where the Extension Service has been challenged with the rapid change of emphasis from one crop system of farming to diversification, from animal power to mechanical power, from scrub to high grades and purebred livestock, from hit and miss to improved pasturage and forage, from a meager to a total of feed supply, and high production per animal.

Not knowing all the existing situation of each respective state, even in the new South, no attempt is being made, as previously mentioned, to project a profound or documented Extension Meat program for any given area, let alone the country as a whole. This is the work of each respective meat specialist who can wisely formulate the meat activities of his state by simply using a series of questions I once heard Ken Warner (U.S.D.A.) suggest to consider in analyzing any given situation. Ken, had this to say: "To analyze a situation and determine the needs and wants of the people concerned I have found the following series of four (4) questions most helpful: (1) What is the situation?, (2) Why is this?, (3) What should be done?, and (4) Why is it not being done now?."

In the development of the meat activities of any State Extension Service every effort should be made to develop an over-all meat program, bringing into the picture all active agencies, with a plea for cooperation, in order to coordinate the work so as to minimize duplication and overlapping. An ideal situation is to have the leadership under the control of the Extension Service, otherwise, the meat program may be absorbed by agencies having a selfish motive at the sacrifice of the good-of-the-cause in some of its ramifications. For success, any and all programs must be developed to do a three-fold job: First, fit into and meet the needs of the people on the local and state level. Second, convey to farmers and urban homemakers practical and applicable information. Third, create an efficient and economical program that will assure plent to eat in a variety of forms, at the lowest possible cost.

After the plan of work is developed, then comes the job of selling the program, first of all, to the Extension Director, then to the State Home Demonstration Agent, District Agents, County and Home Agents, and those on the university staff who are responsible for meat research and teaching. This being done, the Extension Meat Specialist responsible for directing the work must then do all that possibly can be done to win the confidence, and secure the active cooperation of all agencies dealing with meat processing and preservation such as: Frozen Food Locker Plants, Custom Slaughtering Plants, School Community Food Preservation Centers, Utility companies, Farm organizations, and etc. The sending of a written, or printed projected meat program to cooperating agencies will not suffice. Experience dictates that it takes personal contact for success, and in many cases repeated contact is the best procedure. An indifferent agency, or agencies, especially those in close contact with the people who are to benefit from the meat program, can make a good program inefficient, as well as, insufficient and non-productive. A good job of selling all along the line is a "must." If the projected meat activities are on a county level, the key persons then become the County and Home agents, and their domain should not be invaded unless the call comes from them, or the program is worked through them.

Publicity is always in order and every channel should be exploited to the fullest. Information can be disseminated through newspapers, special news organs, and other press participants, supplemented with radio spot talks, as well as skits over television, and movie films, if available. The success of any program is dependent upon how much interest can be created and all publicity releases should be made complete. The publicity must be well planned and ready to put in motion at the right time and place, far enough in advance so as to create interest, and a desire for participation in the program by the people concerned. To interest the people to be reached, they must be educated as to the aims of the program, the facts to be projected, the methods, and demonstrable results.

The meat specialist should have the plan of work well organized and sufficiently flexible to meet changes and new situations that may develop. The activities, large or small, on a local or state level, should be administered in a true educational spirit and with no selfish implications. It does not matter who gets the credit, or what-have-you, it's the overall productiveness of the work that counts.

In conclusion may it be known that I have chosen, in this article, to comment on suggestions to consider in planning, instead of developing a plan for a "Meats Program" mainly due to the fact that the Louisiana Extension Division has no meat specialist on its staff. Associate Professor Crown and I do considerable meat extension work in response to off-the-campus requests, coming from Home and County Agents, Frozen Food Locker Operators, Civic Clubs, Farm Organizations and School Community Food Preservation Center patrons. We work from special calls only and not from a definite and planned meats program; however, we do direct our activities with a sound and practical approach, and in keeping with accepted trends and procedures. A summation of our activities, for any given year, could be developed into a planned program which would be an acceptable one in any given regions of the United States, especially the deep South.

# # #

WORK PLAN FOR AN EXTENSION MEATS PROGRAM

W. L. RICHMOND
MISSISSIPPI STATE COLLEGE

The general shift to more livestock has resulted in more meat animals on farms than ever before. An expanding rural electrification program makes it possible for more farm families to have home zero storage cabinets. Using the services offered by locker and meat curing plants coupled with a larger supply of meat animals and better home facilities for preserving meats makes it possible for farm families to have more varied, more nutritional and higher quality meat diet.

Canning of meats and curing of some pork cuts is supplemental to freezing on farms where zero storage units are used or other freezing facilities are available. Farm families find that freezing affords a year round supply of fresh meats. It is a wholesome situation.

Much educational work is needed to acquaint farm people regarding selection and processing of meats for freezing, using the storage cabinets properly and also improving quality of cured pork products. The locker and meat curing plants in this state are excellent mediums through which to project this phase of an extension meat program.

The services offered by the plants are designed for use mostly by families that produce their own food supply. Farm families will have better products, generally speaking, when facilities and services offered by the plants are used. Plant managers are encouraged to cooperate with farm families who own zero storage units. When serving this group, the plant increases its income and at the same time provides a real service to the farmer. Then, too, the locker plant is in a position to aid farmers in the selling of surplus meat. Farm peopl are getting more quality meat conscious as is evidenced by the improved quality of carcasses handled by plants.

Farm Pork and Beef Slaughtering, Cutting and Curing Demonstrations - Continued interest has been demonstrated by agents for assistance in conducting farm hog slaughtering, pork cutting and curing demonstrations. Because of this type of work being conducted in the fall, there is a limit to the number of demonstrations that can be given. Fifteen or more such demonstrations are conducted each year. Usually these demonstrations are held on the farm with the thought of trying to improve the job and the quality of the meat with the facilities used on the average farm. The demonstrations usually last about one and a half hours and wherever possible, participation is urged on the part of a number of those present.

Usually the county agent arranges for a chilled carcass which was slaughtered prior to the day of the demonstration. In many instances, this arrangement is made with the local meat curing plant. Often these demonstrations are held in cooperation with the local meat curing plant. When this happens, both phases are discussed relating to curing; that is, the job as performed by the plant and as it differs from how the meat would be handled on the farm. The demonstrations have been well taken and plans are to continue this phase of the work.

Informational material is passed out at these meetings regarding slaughtering, cutting, curing, construction of smokehouses, scalding vats, and knife sharpening.

Frozen Food Locker and Meat Curing Plants - During the year the specialist contacts the locker and meat curing plants. Assistance and recommendations rendered included handling of fresh meat carcasses, pork processing, chilling and aging meats, cutting and wrapping meats, demonstrating recommended methods of curing, checking curing rooms and handling of pork, smoking of pork, records used by plants, and arranging meat processing demonstrations for farm families and juniors.

Slaughtering service is recommended in all plants of appreciable size. Records show that over the years there has been a steady increase in the number of farmers that have animals slaughtered at the plants. This provides the operator a better opportunity to provide farm families with higher quality frozen and cured products.

Shortly after World War II there was a general let-down in the business of locker plants due primarily to two reasons: the introduction of home zero storage units and increased meat prices. The industry has taken on new life by working more closely with farm families as relates to processing of meats for home zero storage units, using better cutting methods, the use of higher quality wrapping material, and putting up a more attractive package. Then, too, owners of home units are learning that there is a limit to the freezing capacity of the units. Few farmers are skilled at meat cutting nor have the facilities to do the job properly and therefore return to the plant for this service.

A majority of the plants in the state continue to turn out quality pork products. Most of the plants use the dry sugar cure method of curing. Plants that offer slaughter service are in a position to do more year round curing; whereas, with other plants, farmers still load them heavily during the fall season, thus reducing the total amount of pork that can be handled. Farmers are encouraged to butcher more than once a year.

Mississippi Frozen Food Locker Association - This organization has been a guiding influence to the industry in Mississippi. Acting as secretary of the Association until two years ago afforded an opportunity to become intimately acquainted with the operators which made the job of assisting them with their problems much easier. Additional work in the department made it necessary that I resign. Present affiliation with the Association relates to assistance in planning programs, training meetings and annual convention.

4-H Meat Judging Contest - This is the fourth year of this contest which is sponsored by Bryan Brothers Packing Plant of West Point, Mississippi. The purpose of the contest is to train 4-H youth to judge and evaluate meat carcasses and wholesale cuts of beef, pork and lamb. Four bonafide club members form a team and each county is allowed one team to participate in the state contest held in June during 4-H Club Congress.

The boys are required to place and give reasons on classes of beef, pork and lamb carcasses and wholesale cuts of beef and pork. The contest usually includes one class of pork carcasses, one class of lamb carcasses, one class of beef ribs, one class of green bacons, and one class of pork loin. This contest has been well received by the assistant county agents. Meat packing plants and locker plants have cooperated in offering their service to the agents for team training. A number of new assistant agents have joined extension during the past two years; therefore, a training meeting for meat judging is planned for assistant agents in the spring of 1952.

Agent Training Meeting - Quite often our Extension program necessitates the training of county and assistant agents. Then, too, we have held a number of training meetings for locker and meat curing plant operators. These training meetings have regarded hog slaughtering, pork cutting, pork curing, beef cutting and wrapping for freezing, meat judging and lamb grazing.

Other Relating Work - This specialist and P. G. Bedenbaugh of the Experiment Station jointly conduct research investigations relating to curing and storage of pork. Our investigations have been published in the Mississippi Farm Research.

Presently investigations are being made by a graduate student, Felton Byrd, regarding control of the skipper fly as relates to cured pork products. The Extension entomologist and this specialist work together in getting this project through and also in planning the procedure.

Assist E. E. Grissom, Extension sheep specialist, in the grading of lambs each spring at the eight lamb pools. Number of lambs marketed is usually around 16,000 a year.

# # #

MEATS EXTENSION IN NEW YORK STATE

G. H. WELLINGTON
CORNELL UNIVERSITY

Last year Professor J. I. Miller presented our paper on Meats Extension. That paper explained how we have planned our livestock extension activities. We lean heavily on committees to analyze the problems and suggest methods of carrying out programs once they are set-up. Committee work is slow and at times seems inefficient, but resulting activities meet with better acceptance when all interested parties have cooperated in the planning of the program.

In New York, as in most states I believe, the County Agricultural Agents or the Home Demonstration Agents make the final decision as to what the college does in their counties. Specialists go to the counties at the request of the local agent. We must first develop the agent's interest and sell the agent on the need for an extension meats program in the county. Most of this motivation is done by day to day contact with agents any time the specialist has an opportunity to see them. This is an old story to extension men but may not be appreciated by others. Certain activities on a state level, of course, are carried out without county agent request. Participation in state wide locker meetings is an example. News releases and certain consumer education activities in the larger cities are other exceptions.

Since personal contact with agents has been so necessary for me to promote county activities, I have not been too enthusiastic about the "Plans of Work and Suggested Activities" we have routinely distributed to agents. We send them annually under the title "Program Suggestions To Agents." Each year they are changed to meet the situation and interest of the people. They are of little value without personal contacts between specialist and agent. This year we submitted the following to agents as a part of our overall livestock extension program:

...E. The need to help farm families in using or selling meats produced on the farm.

1. Situation:

a. Beef selected for home slaughter continues to be of low quality on too many New York farms. Dairy farmers could eat better quality beef by selecting younger animals and feeding grain for a limited period before slaughter.

b. Hog numbers have increased in New York State. More farms could produce the family pork supply.

c. With increased interest in farm ewe flocks, more thought should be given to including lamb in the home meat supply. It has the advantage of providing a small unit of dressed meat practically all of which is tender enough for roasting or broiling.

d. Livestock farmers have a potential market for their animals through sale to locker patrons. Assistance can be given by presenting information on how to price dressed meat, how to slaughter or arrange for the slaughter of these animals.

e. Freezing continues to offer the best method of preserving the bulk of the farm meat supply.

f. Frozen food locker plants offer valuable service to livestock farmers. These plants not only preserve tons of meat for individual farm family use, but their existence allows farmers to sell more of their product locally.

g. As mentioned under marketing suggestions, livestock producers need more information on shrinkage, dressing percentages, factors affecting meat quality, and methods of reducing livestock and meat loss incident to marketing.

2. Suggested activities:

a. Invite local frozen food locker managers to some program planning meetings held by county livestock commodity committees. Solicit managers' suggestions for including meats information as a part of county livestock meetings.

b. Include a discussion of the sale of finished animals locally as a part of some livestock meetings.

c. Include demonstrations of the relationship between accepted type and carcass quality at producer meetings. Dressed carcasses may or may not be included in these demonstrations,

d. Organize marketing tours to larger slaughtering plants to observe differences in meat quality from different animals and discuss shrinkage and dressing percentage.

e. Include a visit to an outstanding locker plant as a part of a winter swine meeting. Study differences in quality and cut-out percentage of lean cuts from heavy compared with lighter hogs.

f. Include a carcass cutting demonstration with discussion of best freezing practices as part of winter production meetings.

g. Hold slaughtering and/or cutting demonstrations. These have considerable appeal to part-time farmers as well as commercial producers.

h. Cooperate with the home bureau in presenting meats information to housewives buying meats. This may be a special meats meeting for consumers or a topic on a county Food Forum.

i. Ask meat specialist and home demonstration agent to show contrast in quality between aged dairy beef and higher quality beef as a part of a beef meeting. Raw and cooked roasts should be used in the demonstration.

j. Encourage dairymen to slaughter younger animals of higher quality for home freezing. Include a demonstration of the difference between aged cow and younger beef as a part of a dairymen's meeting, if county dairy committee has the interest.

...F. The opportunity to assist urban and rural housewives in meat buying.

1. Situation:

a. Meat prices are at high levels compared with prewar prices.

b. Often farmers are unjustly blamed for the high price of meats.

c. Housewives are interested in getting the most of their meat dollar, and in increasing their knowledge of meat cuts.

d. Not all housewives have been able to keep informed on the new changes in meat prices, meat grade changes, and the recommended cooking methods for the new grades. For housewives to benefit from the government grade and price program, they need to understand it.

2. Suggested activities:

a. Cooperate with home bureau in planning meats meetings for housewives. These meetings can be of different types depending on how recently the home bureau has covered their meat lesson series and other factors. Suggested types of meetings are:

(1) County-wide consumers' meats meeting emphasizing changes in grades, factors denoting quality, economy of various cuts, etc.

(2) Include meats in county Food Forum. Agricultural economist may explain the factors involved in high meat prices. Meat specialist may present information on grades, quality, and economy of various meats. Key livestock farmers may present some of the cost information incident to meat production.

Demonstrations of meat cooking methods should be handled by Food and Nutrition specialist or county home demonstration agent.

Encouragement from the county livestock committee and agricultural agent may lead to very successful cooperative meats meetings for housewives. Consumer meats meetings benefit both the producer and the consumer.

- - -

It would be next to impossible to give a complete picture of what we do in meats extension without taking much more time than we have today. Let me explain briefly how we have attempted to get consumer information to urban housewives. This will serve as an example of one phase of our work.

The New York Metropolitan Area constitutes about 15 million people to say nothing of 7 to 8 million urban residents of upstate New York. What can one meats extension specialist hope to accomplish with so many? Acting alone, I think you will agree, it would be very little. The first approach has been to work with the existing extension organization and help feed meats information into it. We are very fortunate to have the Regional Food Marketing Program established.

The food marketing program really got under way with full time staff members under the Research and Marketing Act in 1948. There are two offices, one in New York City and an upstate office in Ithaca. It is advised by extension personnel at Rutgers and the University of Connecticut as well as Cornell. County agents in these neighboring states are included in the regional planning.

In the New York office there is an Agricultural Economist and a Home Economist. In Ithaca there is an Agricultural Economist and two Home Economists. The purposes of this program are:

1. To help families make good use of their food dollar.

2. To help families make good use of the food supply.

3. To create a better understanding between those who produce, handle, and buy food.

4. To keep consumers informed about current market conditions - supply and price.

Personnel of the food marketing program likewise makes use of broader public contacts in the form of editors that have an established following of readers, broadcasters who have a following of listeners, and should I say "watchers" under television. We in livestock extension have worked with the food marketing personnel in preparing consumer meats information for their use. Here is how they distribute their information.

1. A weekly publication called "Focus" is prepared for editors, radio stations, and others with established followings. Some upstate county agents and home agents receive this. The distribution in New York City is 500 copies. Each issue has one to three features. It may be snap beans, asparagus, and pork for instance. It is interesting to note that "Focus" is used by the largest New York papers and also by magazines, advertisers, health and welfare workers, city libraries, schools, and labor unions for their health programs. "Focus" does not go to individuals.

2. "Highlights." This publication has been in distribution about one year for those buying and preparing food for small institutions. The distribution is 330 in upstate New York and 700 in the Metropolitan area. "Highlights" also goes to visiting nurses, charities, childrens' homes, day nurseries, private nursing homes, etc.

3. Exhibits. Typical of this activity is an exhibit we built up entitled "Rare Beef" intended to tell the story of supply and demand. "Rare Beef" has been shown by the food marketing staff in upstate New York and requested by some libraries in the city.

4. Food Forum. Typical here was a two day forum held in Schenectady. I was present to tell my own meat story first hand on this program. We made one serious mistake. The Forum was scheduled on the same days the Meat Board held a cooking school in Schenectady. We still are not big enough to compete with a Meat Board Cooking School. Our attendance was slim.

5. Skits. We have assisted Food Marketing by participating in a skit on meat buying.

6. Television. Food Marketing has a weekly television broadcast in New York. We have used meats in some of the upstate television broadcasts with them.

In closing, I would like to say that we make our best progress on large projects such as consumer education when we all pitch in and forget about who is going to get the credit for it. At times people become concerned about who will get his name in the news and whose annual report will get the credit. Meats extension must tie in with so many programs that the specialists will accomplish most by forgetting all about who gets the credit and help those in existing programs to give the true educational story about meat to the most people.

# # #

WEDNESDAY MORNING SESSION

JUNE 11, 1952

The meeting convened at eight-forty o'clock, Chairman Bray presiding.

CHAIRMAN BRAY: Good morning, everyone and I hope you had a most restful evening! Since we have a full program this morning I think it is time for us to get under way and let the late risers arrive as they please.

The first report this morning is going to be heard from the Lamb Carcass Evaluation Committee, and the chairman of the committee is George Vander Noot.

I will now turn this meeting over to George Vander Noot, Chairman of the Lamb Carcass Evaluation Committee.

LAMB CARCASS EVALUATION COMMITTEE

1. G. W. Vander Noot, Chairman
   Rutgers University, New Brunswick, New Jersey
2. F. D. Carroll, University of California, Davis, California
3. A. W. Oliver, Oregon State College, Corvallis, Oregon
4. Desmond B. Watt, University of Missouri, Columbia, Missouri
5. E. P. Margerum, Jr., University of Wyoming, Laramie, Wyoming

MR. VANDER NOOT: I should like to asky my committeemen to come up here. Professor Oliver of Oregon. Kemp of Kentucky. I had a hard time keeping up with him. He was all over the country. He just could not make up his mind where he was going to locate. Margerum of Wyoming. Professor Carroll of California.

The first paper we would like to present this morning is Ed Margerum's paper and discussion on how lamb carcasses should be cut.

FIFTH ANNUAL RECIPROCAL MEATS CONFERENCE

E. P. MARGERUM
UNIVERSITY OF WYOMING

Uniform Slaughtering and Cutting Methods for Lamb:

Last year's conference report by the Lamb Carcass Evaluation Committee pointed up the two most generally acceptable methods of cutting lamb carcasses. The first method, as presented in Professor Wilford's paper, concerned itself with the breakdown of the lamb carcass as practiced at the Beltsville, Md., Agricultural Research Center of the Bureau of Animal Industry, U.S.D.A. The second method reviewed by Professor Wilford was that which is recommended by the National Livestock and Meat Board.

The discussion which followed that paper is the basis for the material which your committee is now about to present.

I - Pre-slaughter

All sheep to be slaughtered for the purpose of collecting carcass measurements and data should be fasted for a standard period of thirty-six hours--the latter ten hours of this period should have the sheep restricted from water as well as feed.

At least twelve hours prior to slaughter, the sheep should be shorn in accordance with good shearing practices and allowed to rest, so that the carcass quality and shrinkage due to unnecessary excitement and handling may be avoided.

Actual slaughter should be patterned after the usual commerical lamb slaughtering practices, where the head is removed at the atlas joint, or the union of the occipital bone and the first cervical vertebra, the forefeet removed at the "break joint" and hindfeet removed at the pastern joint. The shorn pelt is removed, and the contents of both the thorasic and abdominal cavities removed with the exception of the kidneys and kidney fat as well as the lean portion of the skirt muscle and the hanging tender muscle.

Weight of the shorn fleece should be secured as well as the weight of the shorn sheep immediately prior to slaughter. Dressing percentage should be computed on the basis of the shorn weight and hot carcass weight--not the live weight of the unshorn sheep or the chilled weight.

Carcasses should be retained unsplit and unshrouded in a cooler having an average maximum temperature of 34°F for a period of forty-eight to seventy-two hours. Weights of the unshrouded hot carcass should be obtained immediately following slaughter, and chilled carcass weight should be secured prior to cutting the carcass.

All weights of the live sheep and the carcasses should be obtained to the one half pound.

For purposes of uniformity and adaptability to retail sales of the products, the following method of carcass breakdown should always be followed when cutting so as to obtain data from sheep carcasses.

Starting in the crotch and cutting out to the flank so as to pass through between the lean of the flank muscle and the fat at the upper forward edge of the leg, continue a straight line cut to the lower end of the thirteenth rib and continue forward across the ribs to intersect the humerus of the upper forearm at the middle. The portion removed, which includes the forearm, breast and flank, may be separated at the natural separation between forearm and breast and also by a cut made perpendicular to the already cut surface and behind the cartilage of the breast - thus yielding three separate pieces.

The corresponding cuts may be made on the other side of the sheep carcass in exactly the same manner.

A cut which is made perpendicular to the line of the back and touches the posterior edge of the fifth rib end will remove a four rib shoulder and the neck. The neck may be removed by a cut which is flush with the top of the shoulder. The two halves of the shoulder may be split with a saw down the middle of the backbone.

A cut made perpendicular to the line of the back and touching the posterior edge of the twelfth rib end will remove a seven rib rack which may also be split along the center axis of the backbone.

The loin is best removed at the anterior edge of the posterior lumbar vertebrae in a line which cuts at right angles to the top line of the carcass.

This cut is made parallel to that which separated the loin from the rack between the twelfth and thirteenth ribs. Again, the loin and leg cuts may be split on the mid-axis.

Further breakdown of the carcass should include the removal of the sacral vertebrae (including such fat and lean as is present) rounding of the flank edge of the leg, trimming of all excess fat in the crotch area, and removal of the lower leg at the hock joint. Finally, the kidneys and kidney fat should be trimmed from the loin.

All measurements secured shall be in the metric system, and all weights taken to the second decimal or at least to the nearest tenth of a pound.

The outstanding changes in this method as compared to the methods put forth in U.S.D.A. Technical Bulletin No. 944 and the second method as presented by Professor Wilford last year are as follows:

1. The sheep are shorn prior to slaughtering and measuring as recommended by Professor Loeffel. This will allow a more accurate determination of yields, and the wool value may be added to the data when differences in animal values are determined.

2. A recommendation is herewith made concerning a standard for fasting, shearing, weighing and cooling.

3. The matter of starting the cut which is to remove the breast, shank, and flank at the crotch eliminates doubt concerning the quantity of tail on the flank. Removal of the shank at the midpoint of the humerus allows the use of the breast and shank as a rolled roast.

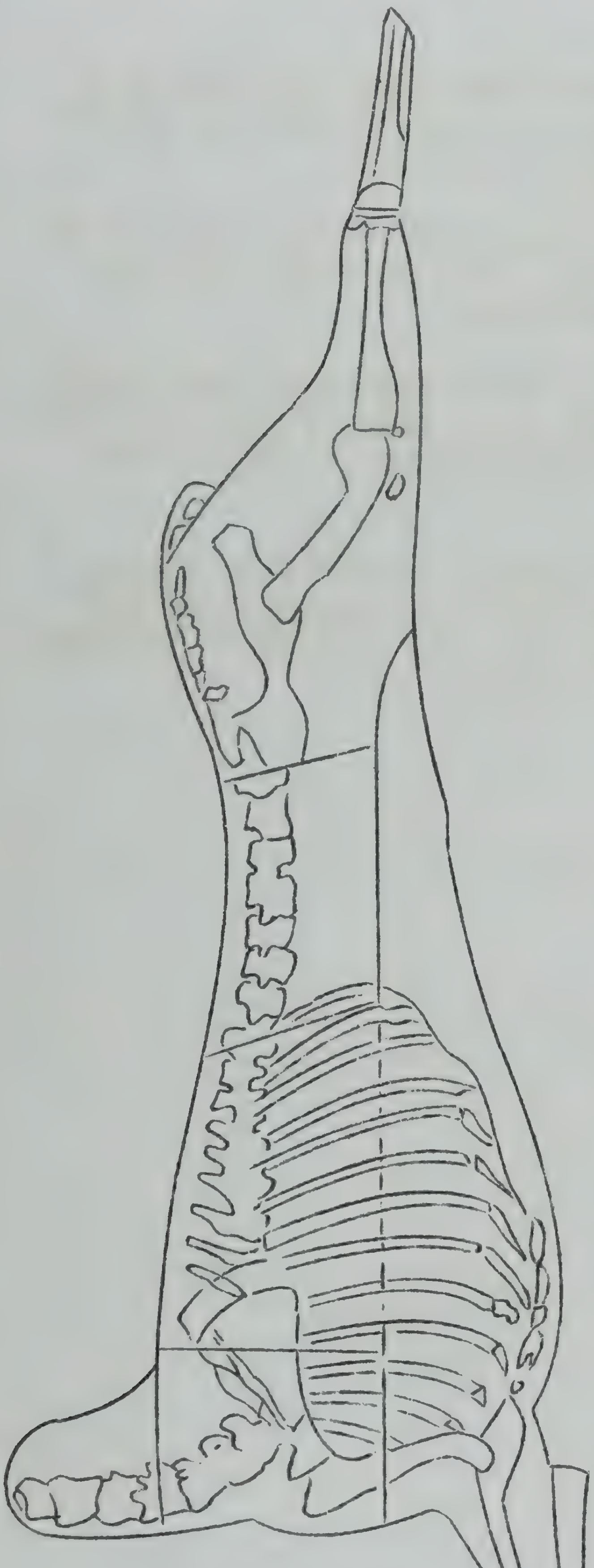
4. Separating shoulder and rack between fifth and sixth rib is a method which will allow a heavier shoulder which more nearly fits the eastern trade practices as per Mr. Edinger's recommendation last year.

5. Cutting the rack from the loin perpendicular to the back and to touch the posterior edge of the twelfth rib gives a more definite point and angle of cutting than has here-to-fore been specified.

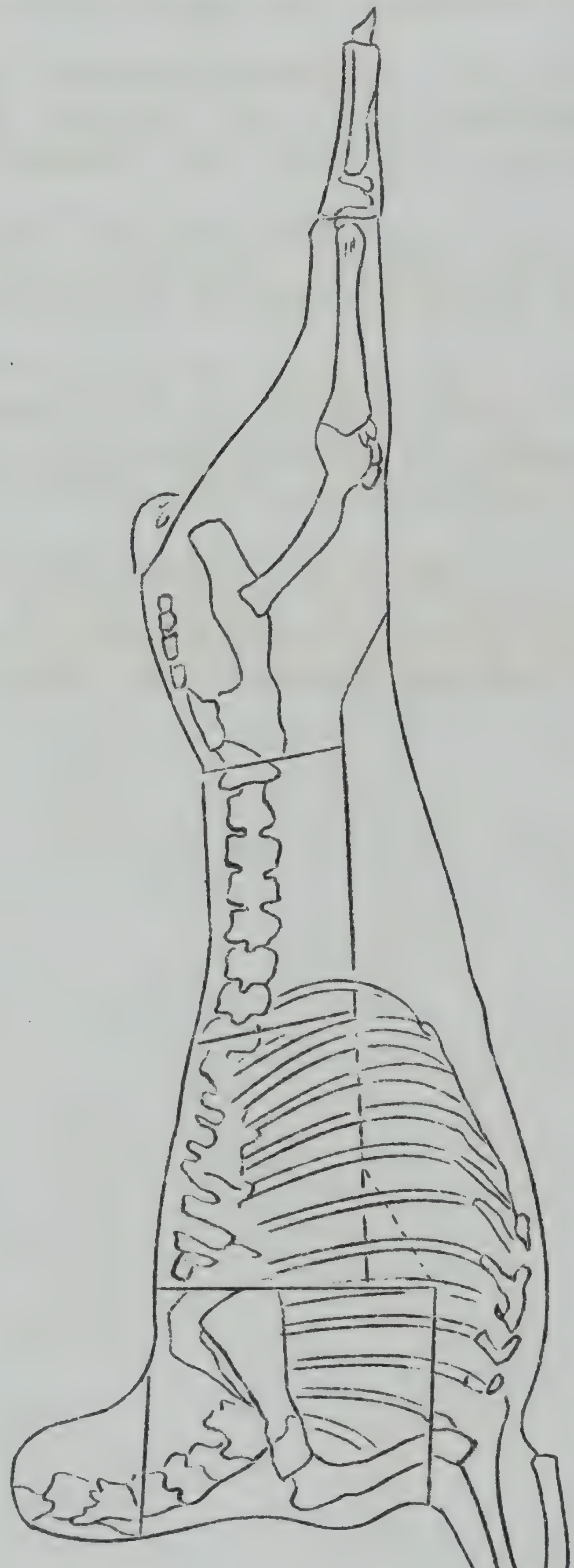
6. Removal of the leg of lamb so as to allow the last lumbar vertebrae to remain on the leg will permit for greater uniformity of leg size and compensate or actually remove the possibility of variations in leg of lamb data due to varying ilium position.

Should you members and participants in this conference so desire, I believe it is most appropriate for us to discuss these recommendations and adopt, reject, or modify them in order to standardize our methods of securing data from the slaughter and cutting of sheep carcasses.

U.S.D.A. Method of Cutting as
Per Technical Bulletin No. 944



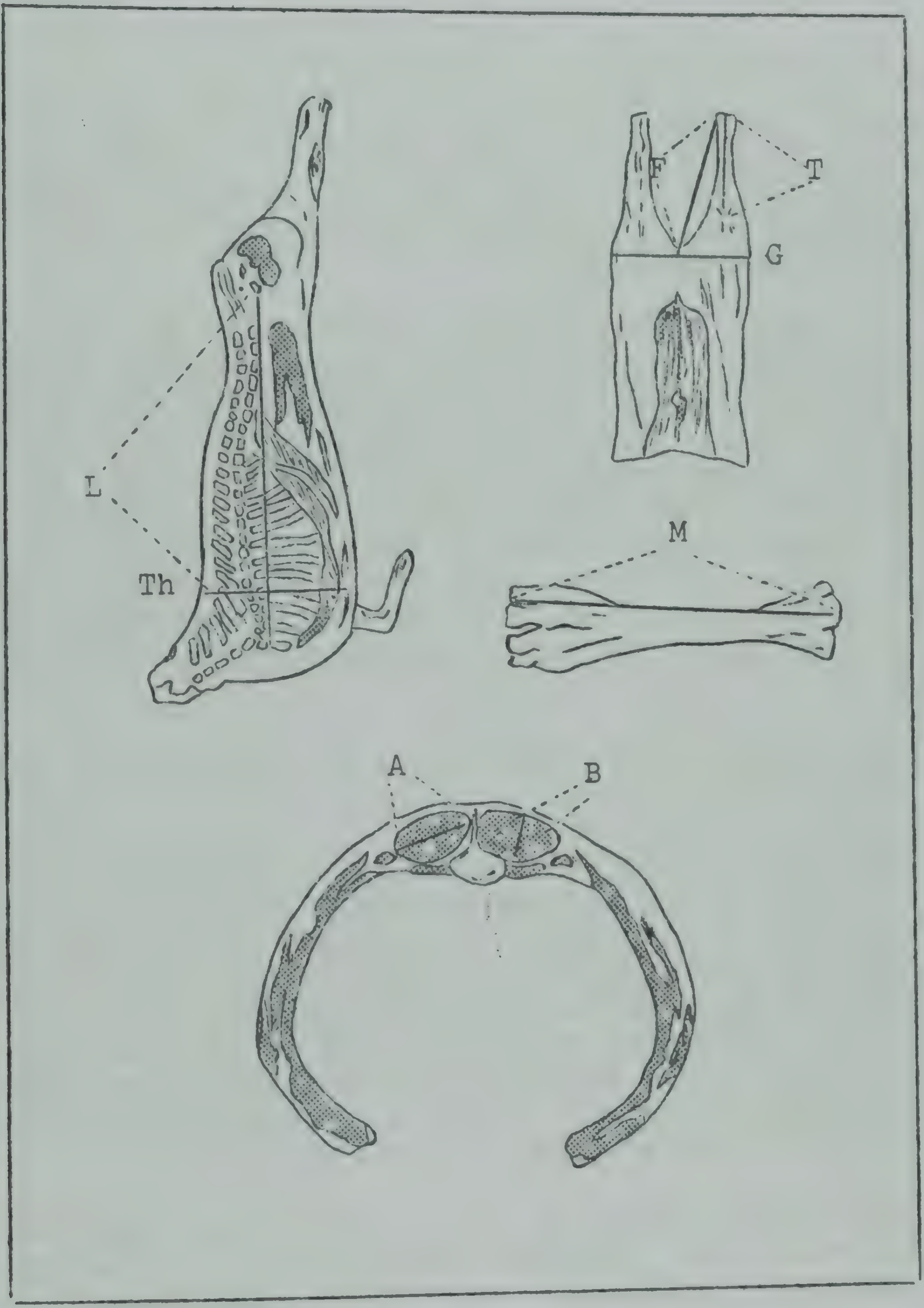
Closely Patterned after the National
Livestock and Meat Board Method



A. MEASUREMENTS AS INDICES OF THE AMOUNT OF MUSCLE

(1) External Measurements

Although these are essentially more indicative of skeletal size than of muscle or fat development, several highly-significant correlations have been obtained between various external measurements and the total weight of muscle in the carcass. Since the carcasses had been telescoped for export, the only external measurements available were G, F, and T.



SKETCH A.--Carcass measurement.

MR. VANDER NOOT: Thank you very much.

I believe, due to the fact that this is the paper that we have filled in and cut out on the basis of last year's conference and have tried to give you a uniform method of cutting lamb carcasses, at this time it would be appropriate to have discussion on Professor Margerum's paper and then follow through with what you think is best. Is there any discussion at this time?

MR. A. M. PEARSON: I am not doing this to find fault with the paper that has been presented, but I merely wish to raise the question of the procedure. I believe the reason this has been set up is primarily to avoid fill and to make our standard conditions. On the other hand, I think Dr. Hall has had some experience with beef and I think he has carried it over into pork now, rather questioning some of our fasting procedures. He may wish to comment on this.

DR. HALL: A period between cutting off the wool and slaughter makes a very decided difference in the keeping quality of the meat that is to be obtained from the carcass, because of the loss or the dissipation of the glycogen in the tissues in fasting; particularly if the animal is hectorcized or excited or shipped before slaughter there is not enough carbohydrate left in the tissue to generate enough lactic acid in the postmortem changes in the carcass to set the tissue up in a fairly solid condition that you feel is desirable and that again makes the tissue subject to spoilage more readily and in the case of curing prevents adequate penetration of the brine into the tissues. That is as much as I know about it.

MR. VANDER NOOT: On the basis of what you have just told us what are you recommending?

DR. HALL: Davey and the rest of us down there started some projects on pigs. We had varying periods of holdover on shipping, some with feed and some without feed. We have had so far three experiments and one which was conducted in the winter during the cold weather. It did not happen to be a particularly cold day either, but it was different from what we are having now definitely, and at that time there was a very radical difference in the amount of glycogen present in the livers of the animals, the generation of lactic acid present in the tissues and in the ability of the hams to take the brine cure.

The maximum period of recovery we allowed there was 16 hours for the pigs with feed. They had feed available all that time, up to the time they were slaughtered. Isn't that right, Davey?

MR. MACKINTOSH: Yes.

DR. HALL: So that is, of course, an extreme variation from the usual practice. We wanted to find out how much difference it makes, and I am satisfied that a long period of slaughter, 36 hours, as you recommend, is running pretty close to the danger point in allowing the animal to retain an adequate amount of carbohydrate. It is generation of lactic acid in the tissue which will allow it to come out a firm type of carcass which you want.

MR. BULL: Mr. Chairman, as I remember, we came to the conclusion that long fasting, particularly under cold weather conditions is what causes dark cutters due to the absence of glycogen sugar. I am wondering if that might not affect the color of the lamb.

MR. VANDER NOOT: Professor Bull, our recommendations were probably given on the basis of what has been done more or less in the past. In our committee discussions nothing was said about what Dr. Hall has just brought to our attention. I am sure the committee will take it under advisement.

Is there any other comment on Professor Margerum's paper?

MR. BUTLER: Why not just empty it after slaughter? You won't get any emptying of the omasum anyway. At least our experience has been that even after holding steers off feed for nine days the omasum was just about as full as it was after the first day, and the content of the abomasum won't be very much. The only real variation would be in the rumen, I think, and it would be a simple proposition just to empty it. I feel that the point that Dr. Hall raised, on the basis of what we checked with steers, is an important point. While it is true that we are trying to get uniform data on this, I think there will be some variability and I believe you will lose more than you gain.

MR. BULL: I might add also, Mr. Chairman, that in some of our older work we cleaned out the contents of the digestive tract and based the data on what we called the empty live weight. I think some of the people are doing that with hogs at the present time.

MR. VANDER NOOK: In our committee we had a little disagreement and we thought perhaps the best way to settle the argument once and for all was to bring it up on the floor for discussion. Kemp and Margerum do not quite agree on the total cutting. On the general plan, yes, but not on the finer points, although I cannot present his ideas.

MR. KEMP: The method that I suggest is a little different from him. We still use the five rib shoulder. The leg is removed at the anterior end of the posterior lumbar vertebrae. But the method of removing the breast and flank that I have suggested is a little different, and from my own personal viewpoint I think it gives us just a little more uniform rib rack and loin cut.

I have a picture here that you probably can see a little. Whereas his cut goes thraight across here, when I get down to cutting this loin and rack, I turn the half carcass -- these were slit before cutting -- skin side down and I made measurements on the inside of the loin and rib or rack. At the rear end I measured four inches from the split vertebrae down to the flank that is on the inside -- it does not show on this picture -- and the front end I measured 2½ inches, which would be with the curve straight from the backbone down to the sixth rib. And that gave me what I consider a fairly uniform rack and loin cut. The variability will be in the breast and flank, but as that is a less important cut than the loin or rack, this gives a little more uniformly priced cut. I just wonder what you think about that.

MR. MARGERUM: Might I ask just where the cut comes out on the front end of the carcass there. In other words, there is a definite step down on the fifth rib area.

MR. KEMP: This is just above the elbow joint, where the breast is removed from the shoulder, whereas yours went up a little higher, at the middle of the humerus. Is that right?

MR. MARGERUM: Yes, mine cut through.

MR. KEMP: This gives a little longer shoulder and a little bigger breast of flank than yours.

MR. OLIVER: It would be less because he has half the shoulder.

MR. KEMP: It is deeper in this area, but not as deep in the shoulder area. That is just a suggestion and I should like to hear what you have to say about it.

MR. VANDER NOOT: Are there any comments?

MR. JOHNSON: Do you think the idea of measuring the distance from the center of the backbone is a good idea when you might have some variability in size, especially if you go from the south down to a western lamb.

MR. VANDER NOOT: Well, are you referring to the measurements?

MR. JOHNSON: Yes, four inches from the center rather than just making an anatomical separation.

MR. VANDER NOOT: I believe you will have to use the anatomical measurement.

MR. JOHNSON: He is suggesting a definite measurement two inches from the center of the backbone rather than the anatomical.

MR. KEMP: The lambs that I used this on were approximately the same size, so it worked out all right. If you are going from 60 pound lambs to 120 or 130 pound lambs there will be more variation. These varied somewhat in weight but the body structures were similar. So that is just a point of discussion and I should like to hear any more comment on it that you have.

MR. MARGERUM: To have it on a proportionate basis, rather than to have an arbitrary 4 inches on the rear and $2\frac{1}{2}$ inches in front, would it not be better to have it worked out in proportions of some sort?

MR. KEMP: It might be better to do that. I have here a description of just the way I did this.

METHOD OF CUTTING LAMB CARCASSES

J. D. KEMP
UNIVERSITY OF KENTUCKY

The carcasses were split with a hand meat saw through the center of the dock, backbone, and neck.

The kidney and kidney fat were removed. The flank was cut from the leg from the point of attachment toward the point of the shoulder. The leg was separated from the loin by cutting squarely in a line at a right angle to the chine bone anterior to the posterior lumbar vertebra leaving one lumbar vertebra on the leg. The hind shank was removed at the break joint. The neck was separated from the shoulder by cutting flush with the shoulder in line with the back. The shoulder was separated from the rib (rack) between the fifth and sixth ribs at a right angle to the back line. The breast with fore leg attached was separated from the shoulder perpendicular to the front of the shoulder just above the elbow joint. The fore leg was severed from the breast at the natural separation and the fore shank was removed at the break joint. In order to make uniform cuts the remainder of the carcass was placed skin down and two points were established by measurements. One point was established at the rear of the loin by measuring four inches perpendicularly from the highest point of the backbone. The second point was establishe by measuring perpendicularly 2½ inches from the highest point of the back bone at the sixth rib. These measurements are to be modified to allow for differences in the size of carcasses. A cut was made between these points separating the loin and rib from the breast and flank. The loin was separated from the rib between the twelfth and thirteenth ribs. The breast and flank were not separated.

The cuts were weighed to the nearest .01 pound immediately after cutting.

- - - -

MR. KEMP: There is one other point on which I disagree with you. Instead of removing that hind shank bone at the hock joint why not remove it at the break joint?

MR. MARGERUM: That would be just as satisfactory.

MR. KEMP: I think it would be better.

MR. VANDER NOOT: I think, if there is no more discussion on Margerum's paper, we should go on.

CHAIRMAN BRAY: Don't you want to decide what you want to do with this? I would decide which method we think should be adopted.

MR. VANDER NOOT: Professor Oliver will now present his material on measurements of lamb.

MR. OLIVER: Mr. Chairman and Gentlemen: I have found this report from New Zealand that I have passed around -- this photostatic copy.

MR. OLIVER: They did quite extensive work there in connection with their Canterbury lamb trade. They did statistical work and found the significant measurements. I thought it lended itself to our use. That is the reason I have had this copied and present it to you.

# # #

MEASUREMENTS OF LAMB CARCASSES

RECOMMENDATIONS FOR SOME PROCEDURES ON LAMB AND MUTTON PROJECTS

A. W. OLIVER
OREGON STATE COLLEGE

Tentative Methods:

For length see diagram _ (Margerum Paper)

L From anterior edge of first rib to anterior edge of aitch bone.

F From crotch to hock.

T Length of tibia, from tubercle on proximal end of the tibia to anterior edge of distal end of the tarsal.

M Length of the fore cannon (metacarpal).

Th Depth of thorax, the maximum depth of chest behind the shoulders.

Internal measurements:

A. Length of eye muscle. The maximum distance across the cross section of the longissimus dorsi.

B. Depth of eye muscle, the greatest distance at right angles to A on the same surface.

Width:

G Width of legs (gigots) outside measurements at widest point. Width of shoulders, from inside of first rib to outside of shoulder for both right and left side, the sum of the two measurements to be the width of shoulders.

Explanation:

The following is quoted from the summary from "Canterbury Lamb" - by D. E. Walker and C. P. McKeekan, Animal Research Station, Dept. of Agri., Ruakura, Hamilton, New Zealand.

> "External measurements provided several suitable indices of muscle development. Length of tibia and tarsus times width of gigott yielded the highest correlation coefficient. Length of eye was the only internal measurement tested which gave a significant correlation with muscle."

Grading:

All carcasses to be graded to the nearest 1/3 grade according to U.S.D.A. grades.

Method of cutting:

Same as method used by National Livestock and Meat Board, a five rib shoulder.

- - - - -

MR. OLIVER: If you have some questions or discussions on this, I will be happy to hear them.

MR. NAUMANN: I should like to raise a question or two about these measurements. First, apparently there is some difference in the style of slaughter in New Zealand and this country and I am particularly referring to where the hind leg has been removed. Most of our preliminary carcass work is going necessarily to have to be done in the commercial cooler from the standpoint of getting adequate numbers.

MR. VANDER NOOT: The first question that was raised was the fasting period. What would be your recommendation to us as to the fasting period? Should it be 36 hours, 24 hours, 12 hours or possibly no fasting period at all? I think that is the first point that should be clarified for this committee, as to what your wishes are.

MR. MARGERUM: Mr. Chariman, I should like to call for a vote on two points, as to whether there should be a fasting period or whether the contents of the parts should be emptied after flood at time of slaughter.

MR. VANDER NOOT: Is there a second to the motion? The motion on the floor is should there be a fasting period or should the contents be emptied after flood.

MR. KUNKLE: I will second the motion.

MR. JOHNSON: That is the contents of the rumen only.

MR. BUTLER: Would you say no fasting period at all? You could make it a 12-hour fasting period and still empty the contents of the rumen and get pretty good data. It is pretty hard to slaughter a sheep with no fasting period.

MR. MARGERUM: I don't mean absolutely no fasting period.

MR. HENRICKSON: Can we get a preliminary recommendation from the folks over at Kansas?

MR. VANDER NOOT: I tried to before but they would not commit themselves.

MR. MACKINTOSH: I think at the present time we are confronting ourselves with two questions. One is that of laboratory procedure and the other is that of collecting data in a packing plant. I am thoroughly convinced that if we are working in the home laboratory the only weight we should consider is that of net body weight or empty body weight, as Sleeter bas referred to it this morning and thereby eliminate any worries about fill. We know that fill can have an enormous influence on any figure we like to take. However, it has been mentioned that in the case of lambs in order to secure numbers it will be necessary to work in a packing plant, which, of course, practically eliminates that possibility. I don't know what can be done with lambs in the packing plant --

MR. VANDER NOOT: Margerum tabled his motion.

MR. OLIVER: I am going to make a motion that we recommend that the shrinkage be not over 12 hours and that they be allowed to have water up to the time of slaughter. I think we will probably find, if that is carried one way or the other, the practice is going to vary quite a bit. The packers out our way on these spring lambs would just as soon have them brought in this morning and send them right to the kill floor, because if you keep these spring lambs around 24 or 36 hours and you take them off feed, even though you give them water they are likely to shrink some in grade because of their restlessness. So I make a motion that we recommend a 12-hour shrink with water.

MR. BUTLER: Second

MR. VANDER NOOT: Any more discussion? All those in favor of Professor Oliver's recommendation indicate by saying "aye"; opposed. (Carried)

It seems to me the next point is whether we should recommend a 3 or a 5-rib shoulder.

MR. BULL: Mr. Chairman, I recommend that we recommend a five-rib shoulder cut off just above the elbow joint.

MR. KUNKLE: I will second the motion.

MR. VANDER NOOT: Any further discussion? All those in favor say "aye"; opposed. (Carried)

Now the next question comes from my own committee member. Well, according to Professor Bull's motion we have already taken care of that and eliminated the elbow joint.

The next one is the lumbar vertebra question. One lumbar vertebra.

MR. MARGERUM: Be allowed to remain on the leg.

MR. VANDER NOOT: Any further discussion on that?

MR. MARGERUM: I will make such a motion.

MR. KUNKLE: I will second it.

MR. MARGERUM: I make a motion that the leg be removed to leave one lumbar vertebra on the leg and that we seldom, if ever, have the ilium exposed.

MR. VANDER NOOT: That motion has been seconded. Is there discussion? All those in favor of the motion signify by saying "aye"; opposed. (Carried)

MR. OLIVER: Now, we are going to have to decide about the breast. In other words, whether you are going to jog off like Kemp, of Kentucky did, or go right straight across like most commercial people.

MR. VANDER NOOT: The question now on the floor is are we going to follow Professor Kemp's recommendation or are we going to cut straight across?

MR. KUNKLE: Gentlemen, if a cardinal rule of meat cutting is to separate the thin from the thick, then I would support Mr. Kemp's suggestion with perhaps clarification and statement of ratio of distances.

MR. KEMP: That will have to be worked out because I haven't taken those measurements.

MR. VANDER NOOT: Do you make that in the form of a motion?

MR. KUNKLE: Yes, I will.

(The motion was seconded.)

MR. VANDER NOOT: Any discussion on the motion that we follow Professor Kemp's recommendation?

MR. OLIVER: I have often wondered whether it is a cardinal rule to separate the thick from the thin or whether we should follow the common commercial method. I would kind of like to have an indication here from you men as to what the majority of the commercial people do in retail markets, whether they cut straight from that elbow joint back to the flank or whether they jog off at the fifth rib.

MR. KUNKLE: In our part of the country lambs are sold as stews, backs and legs. So you just don't get a chance to buy the square cut shoulder from any packinghouse.

MR. VANDER NOOT: The motion is already on the floor and seconded that we follow Professor Kemp's recommendation for cutting with the job in the shoulder and also that there should be some reservation made with more data to be collected. I should like to call for a vote now. All those in favor signify by saying "aye"; opposed. Carried.

There is only one thing left for us to do and that is to ask if there is any further discussion or Professor Oliver's recommendation for measuring.

MR. BULL: Mr. Chairman, since these are the only measurements that have ever been reported on lamb, it seems to me that we would be sticking out our necks if we assumed they are the perfect ones to make; therefore, I move that this matter be held over until next year and in the meantime maybe someone will have something else to present on the measurement phase of it.

MR. VANDER NOOT: Professor Bull, to the best of our knowledge has anybody been utilizing any measurements for lamb, and, if so, just what methods have they followed?

MR. BULL: I don't know.

MR. VANDER NOOT: Well, could we not look at it this way: At least here is some place to start. Whether it is right or wrong we won't discuss the point at this time, but perhaps if we are willing to try these measurements, if we find they don't work out, we can rectify our error at the next meeting. I don't think we are quite in a position to turn them down completely or to lay them over until another year, because we have nothing to gain by laying them over another year.

MR. BULL: Well, my motion implies just what you have suggested, namely, that we make some measurements, compare them with these, and then report back next year.

MR. VANDER NOOT: Is there a second to the motion?

MR. BUTLER: Second.

MR. VANDER NOOT: Is there further discussion?

Would you like to take a vote on Professor Bull's motion that this should be laid over for another year and that those who wish to use it as a guide can do so and report on it at a future meeting? All those in favor signify by saying "aye"; opposed. (Carried)

Well, at this time I should like to thank the members of my committee for the fine job they have done on short notice particularly and I appreciate the help and advice and discussion that we have had from the floor.

CHAIRMAN BRAY: Next on our program we are going to turn to the Beef Carcass Evaluation Committee, with Professor Mackintosh as chairman. They came to us last year with some well outlined procedures for slaughtering, cutting measuring, etc., beef carcasses, and, as I understand it, they are in a position to make definite recommendations at this time. Professor Mackintosh.

BEEF CARCASS EVALUATION COMMITTEE

1. D. L. Mackintosh, Chairman
   Kansas State College, Manhattan, Kansas
2. C. H. Adams, University of Nebraska, Lincoln, Nebraska
3. R. J. Deans, University of Michigan, East Lansing, Michigan
4. O. G. Hankins, B.A.I., U.S.D.A. Beltsville, Maryland
5. M. H. Hazaleus, Colorado A. & M. College, Fort Collins, Colorado
6. M. C. Heck, University of Arkansas, Fayetteville, Arkansas
7. C. E. Murphey, Standardization & Grading Division,
   P.M.A., U.S.D.A., Washington, D. C.
8. H. D. Naumann, University of Missouri, Columbia, Missouri

MR. MACKINTOSH: What we are trying to do this year is to outline in a 1, 2, 3 form the steps that we believe should be allowed in so far as possible when carrying on experimental work with beef. We will try to do it in chronological order and to take up the procedure for slaughtering experimental cattle, it will be by R. J. Deans. I don't know whether he claims to be from Ohio or Michigan.

# # #

AN OUTLINE OF SUGGESTIONS ON SLAUGHTER OF THE BEEF CARCASS EVALUATION COMMITTEE

R. J. DEANS
UNIVERSITY OF MICHIGAN

It is assumed by the Beef Carcass Committee that workers contemplating beef cattle research are familiar with basic slaughter procedures. In event reference is desired it may be found in "The Meat We Eat" by Ziegler or in the 1951 Report of the Beef Carcass Evaluation Committee.

I. Pre-Slaughter Planning.

Aside from basic slaughter equipment necessary, it is helpful to have the following:

A. Platform scale - at least 2,000 lb. capacity.

B. Bench scales - graduated in tenths and pounds, 250 lb. capacity.

C. Overhead track scales - 1,500 lb. capacity.

D. A number of weighed receptacles

1. Weighed container for collecting blood of animal should have 5 gal. capacity and wide opening. (A watertight weighed wheelbarrow with steep sides works well).
2. Weighed pan for liver, heart, tongue, cheeks, brain, etc. Should be large enough to eliminate crowding these parts - this facilitates rapid chilling. Pans 20" x 28" x 4" should be large enough.
3. Tray upon which to place head upon removal from carcass.
4. If other visceral parts need be saved a pan for this purpose would be helpful.
5. Weighed pan for caul fat. -
6. Weighed pan for ruffle fat. -
7. Bushel shaped metal containers may be used for weighing and handling intestines.
8. Viscera carts should be weighed and can be used for obtaining paunch weights.

Containers made of stainless steel are easily cleaned and present a attractive appearance. In addition to the above, several flat metal trays oft come in handy for holding various other parts to be measured and studied ex shanks.

II. Weights and Measures

A. For ease of calculation weights should be recorded in tents of pounds and measurements in terms of centimeters respectively ex 8.2 pounds.

B. Methods of Identification.

There are several methods commonly employed for this purpose.

1. Tags secured with slips or skewers.

The advantage of this method is that rather detailed data ca be recorded on the tag and secured to the carcass and organs However, the use of tags presents the problem of the tag being torn off and identification lost.

2. Indelible marking pencils.

By moistening various regions of the carcass and marking with indelible pencil identity can be established which can not be torn off. While it presents a sanitary problem, this method is the most reliable in avoiding loss of identification.

The use of indelible pencils is not ideal for marking such organs as liver, heart, brain, etc. These may sometimes be identified by tagging or by carefully keeping them in marked containers.

C. Standardization of Technique

1. Dew claws, ears, muzzle, switch. These parts should be left on the hide and may be removed after weighing.

2. Udder Removal from cows - The question of whether the entire udder should be removed or merely "functional tissue" should be considered. More uniform results can be obtained by removing the entire udder. It is accepted practice to allow the entire udder to remain on heifers.

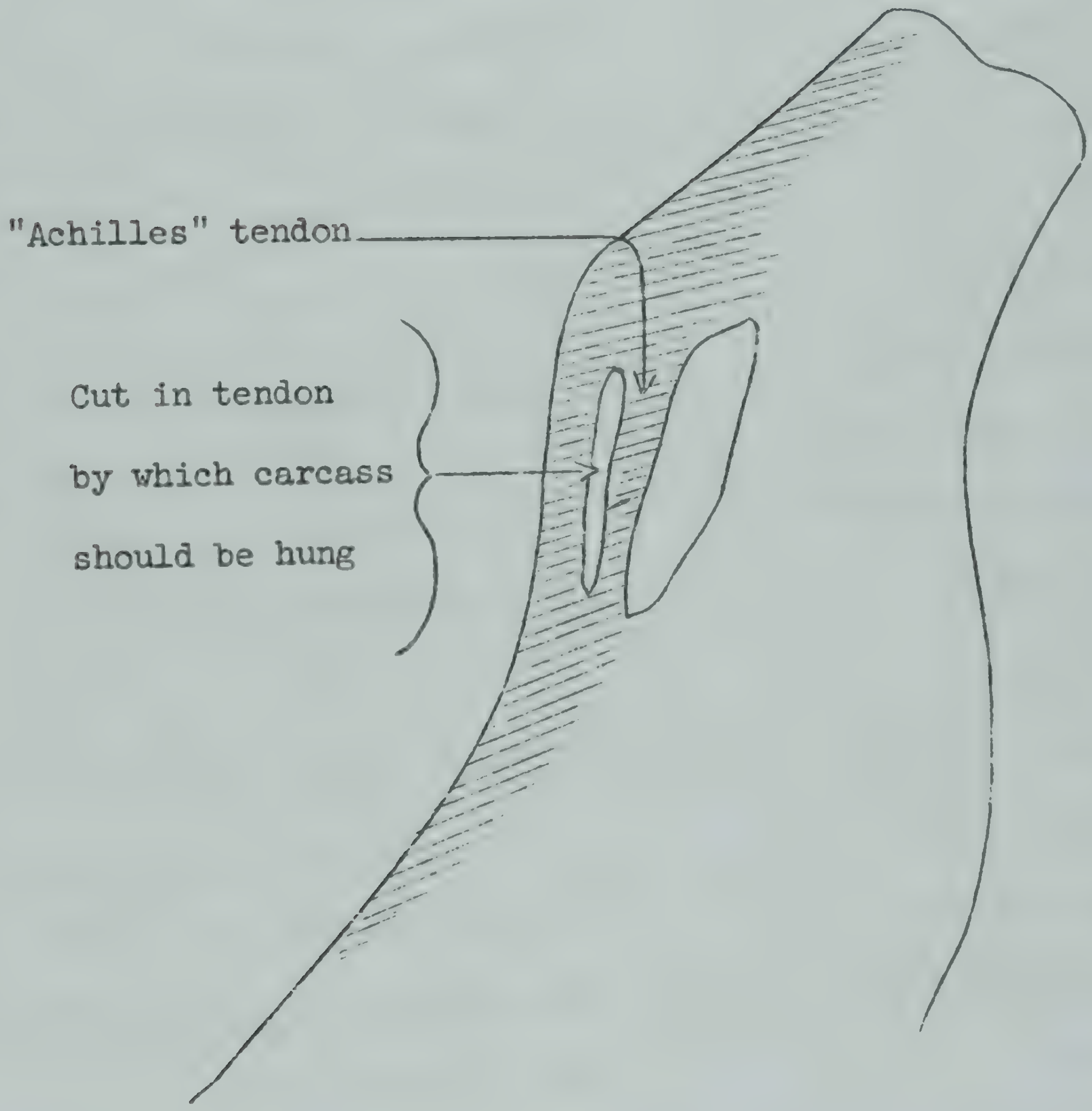
3. Removal of Fore and Hind Shanks.

It is suggested by this Committee that fore shanks be removed at carpal-metacarpal junction and hind shanks at the tarsal-metatarsal junction.

4. Tying bung, Esophagus, etc.

   The bung, esophagus should be tied off with twine to prevent the loss of contents from these parts. Tie off intestine in two places before separating it from the stomach.

5. Carcasses should be hung by the achilles tendon as shown below not from the area between the tendon and the shank.


"Achilles" tendon
Cut in tendon
by which carcass
should be hung

Experimental Beef Slaughter Record

_____Time, Date of Slaughter

_____Identification

_____Sex

_____Breed

_____Live Wt. at Slaughter

_____Blood (lbs.)

_____Head (lbs.)

_____Fore leg & feet (lbs.)

_____Hind leg & feed (lbs.)

_____Caul fat

_____Hide

_____Pluck

_____Paunch (lbs.)

_____Intestine (lbs.)

_____Empty paunch (lbs.

_____Empty intestine (lbs.)

_____Total fill

_____Ruffle Fat

Optional _____Brain

" _____Bladder (lbs.)

" _____Empty Bladder

" _____Urine (lbs.)

" _____Height of withers

" _____Heart girth

" _____Depth of Chest

" _____Circumference of middle

" _____ " rear flank

" _____ " shin bone

" _____ " round (right to left Patella)

Time taken off feed__________

Wt. End of Feed __________lbs.

Wt. 24 hr. shrink __________lbs.

Shrink (24 hr.)_______lbs._____%

Total time off feed __________

Total shrink _______lbs._____%

Price _______Cost ______

Liver __________lbs._______value

Heart __________lbs._______value

Tongue__________lbs._______value

Sweetbreads______lbs._______value

Cheek meat ______lbs._______value

Tail ______lbs._______value

Carcass number

Hot carcass R.________L.________

Chilled carcass (24 hr.)

R.________L.________

Chilled carcass (48 hr.)

R.________L.________

Cooler shrink ________lbs.

Dressing % ________hot

Hot dress wt.-2½%______

Actual cold dress %______

Carcass cost _________

Misc. Loss __________

MR. DEANS: Does anyone have any suggestions for marking the carcass? We will be very much interested in finding something that will work.

MR. COLE: As a means of clarification, you say hot dressed minus 2½ per cent. Is that 2½ per cent just a straight out figure you are going to subtract from the dressing based on the hot weight or 2½ per cent taken from the hot weight and then determine the dressing weight?

MR. DEANS: In terms of relating it back to the live weight or in terms of the carcass. We have both here.

MR. COLE: What I am getting at is when you cannot get a chilled carcass weight are you going first of all to determine your hot dress weight, dividing live weight into the hot dressed weight, and then 2½ per cent or are you going to take 2½ per cent times the hot dressed weight?

MR. KEMP: What difference does it make?

MR. DEANS: Rather than taking 2½ per cent minus, I think we ought actually to standardize that situation.

MR. MACKINTOSH: One of the things we corresponded about particularly was that shrink. We decided to put 2½ per cent down there and let you shoot at it. It is intended to be a straight 2½ per cent shrink of hot weight. It is the normal procedure in many plants.

MR. COLE: In other words, you shrink the hot weight 2½ per cent and then divide it by the chilled weight to determine the dressing per cent?

MR. MACKINTOSH: You can do it either way. If you want cold weight you can do it the other way.

MR. COLE: Of course, we know that coolers will shrink meat all the way from 1 up to 4 per cent, but I think it should be standardized.

MR. WANDERSTOCK: I move that we approve Mr. Deans' report.

MR. KLINE: Second.

MR. BUTLER: What do you mean by height of withers? Is that height at the withers.

MR. DEANS: It would probably be better if we said height at the withers of the live cattle. These are all live cattle measurements.

MR. MACKINTOSH: All those in favor of the motion that this outline be accepted and incorporated as something of a standard or reference will say "aye"; opposed. (Carried.) I believe it is accepted.

The next one in chronological order is our disappointment. I don't mean the individual is a disappointment but it is one which we failed on last year and we have again failed this year. That is, to come in with a specific set of recommendations for breaking up a carcass for experimental procedure.

MR. MACKINTOSH: Now we will go on to the next section which is again in outline form, "Outline of Desirable Chemical and Organleoptic Tests that Could Be Made." Our desire here again was to isolate those which had been proven as usable to some degree and to outline them for specific reference. You may have some you would like to add or maybe some of those that we are recommending as standard procedure you will wish to eliminate. But Charley Adams has done this work and we have had a lot of correspondence on it. So we will let him present it.

# # #

OUTLINE OF DESIRABLE CHEMICAL AND ORGANOLEPTIC TESTS AND CERTAIN PHYSICAL MEASUREMENTS THAT COULD BE MADE ON CARCASS BEEF

C. H. ADAMS
UNIVERSITY OF NEBRASKA

The purpose of this outline is to list the more common tests and measurements which may be performed on beef. References which provide procedures are also given for making the various tests or measurements. It is not the purpose of this outline to furnish all the tests and measurements which may be performed on beef.

I. Physical Measurements.

A. Composition. Separable lean, fat and bone of ninth, tenth and eleventh rib cut. (U.S.D.A. Tech. Bul. No. 926, 1946. "Estimation of the Composition of Beef Carcasses and Cuts).

B. Marbling.

1. Determined by ether extraction of the rib eye. (See reference for Fat chemical tests).

2. Descriptive evaluation as used by U.S.D.A. Grading Service using one through eleven gradations. (PMA Regulation No. (().

3. Photographic reference standard using one through eleven gradations. (USDA Grading film strip and script).

C. Color.

1. Use of Munsell spinning discs. (Proc. Am. Soc. An. Prod., 1932. pp 345-353).

2. Use of Munsell color standard "A" manufactured by the Munsell Color Company, Baltimore, Maryland. (U.S.D.A. Misc. Pub. No. 580, 1946. "Color Measurement and Its Application to the Grading of Agricultural Products").

D. Tenderness. Tenderness score by mechanical shear on the cooked sample. (Warner-Bratzler shear test as reported by Professor Bratzler at the 2nd Annual Reciprocal Meat Conference, 1949).

E. Press Fluid. Use of the Carver Press for extracting press fluid. Kans. Tech. Bul. 58, 1944, p 35 or Journ. Agri. Res. Vol. 66, No. 11 1943, p 403). (Use of pressometer, Childs, Minn.)

II. Chemical Tests.

A. Fat.

1. Ether extraction of fat of the rib eye of the ninth, tenth and eleventh rib cut. (Use standard procedure for ether extraction from the "Official Method of Analysis," Seventh Edition, 1950, of the Association of Official Agricultural Chemists).

2. Modified Babcock method.

3. Specific Gravity. (Journ. An. Sci., Vol. 10, No. 1, 1951, pp 97-103).

B. Total Nitrogen. (Kjeldahl-Gunning-Arnold method given in AOAC).

C. Non Protein Nitrogen. (Method given in AOAC).

D. pH. (Method given in Kansas Tech. Bul. No. 58, 1944, p 37.)

III. Organoleptic Tests.

A. Tenderness, juiciness, flavor of lean and fat, aroma, texture, and color of lean and fat.

B. Method of conducting tests.

1. Prepare ninth, tenth and eleventh rib of opposite side when possible or the seventh and eighth rib of the same side by roasting according to the standard procedure given by "Meat and Meat Cookery" of the National Live Stock and Meat Board.

2. Palatability committee of at least five members to estimate tenderness, juiciness, flavor of lean and fat, aroma, texture, and color of lean and fat using Meat Cooking Record Sheet No. 7 as developed by the Cooperative Meat Investigation Committee and in "Meat and Meat Cookery."

IV. Histological Samples.

A. Study of muscle fibers, etc. ("Study of Fresh and Aged Beef Ribeye," Journ. An. Sci., Vol. 9, No. 4, 1950, p 645).

V. Physico-Chemical Tests.

A. Electrical resistance as an index to tenderness and quality. (Conf. on Coop. Meat Inv., Vol. 1, 1937, Methods Ref. No. 27).

- - - - - - -

MR. HANKINS: We made some recent studies on this item A here, that is, separable lean, fat and bone of ninth, tenth and eleventh rib cut, specially to get at the question as to whether the method works as well with a group of cattle that are quite uniform in weight. In one case we had 84 steers, as I remember it. Those 84 steers varied widely in weight and age and fatness, and what have you. So recently we pulled out a group -- I cannot tell you now just how many it was, but we pulled the hearts out of these 84 so we could narrow it down to a narrow range of final weights and we ran the correlations again and we found very little change in the correlation values.

I think you will be interested in that. Some of you boys are facing the job of evaluation work in connection with breeding projects where they aim at a certain final weight. This would indicate that the uniformity of the final weight is no obstacle to the use of this method.

MR. ADAMS: Thank you very much. I need some encouragement because I have work to do with this regional group 3 laboratory.

MR. WANDERSTOCK: On this Munsell color method, we use the spinning disk method, and it is rather laborious to get your final hue, chromo, and so on, values. It is also rather difficult to interpret the results once you get the three values. After we had determined the values and had gotten a preliminary idea what the values represented, I wrote to the Munsell Company and asked them if they could check the interpretations. Those of you who are using the spinning disk, Munsell system might write and send a summary of your data to the company for checking. They did not charge us for the service and I am sure they won't charge you. It has given us a more expert idea of just how we are interpreting the data.

MR. PEARSON: I have several comments to make.

First of all, I think under the ether extraction we should add the words "of the rib eye" there or some particular muscle. Otherwise, I think we will run into the intermuscular fat as well as the intramuscular fat.

Then the question of juiciness. I rather question the desirability of the Carver Press as a measure of juiciness. In a questionnaire which we conducted last year, there was very little confidence expressed in the Carver Press as a measure of juiciness. I think Dr. Hall may have some comments to make on that.

Then finally on coming to the chemical test for fat, I should like to state that the specific gravity method is not adapted to small cuts and small samples. As I understand it, it was developed for carcass measurements.

MR. ADAMS: Dr. Hall, would you like to carry on about the Carver Press?

DR. HALL: I agree with what Dr. Pearson has to say about that. The business of getting a juice sample from a piece of meat by the use of the Carver Press has some general applications, but I don't believe one of them is to try to correlate with the palatability quality with regard to the juiciness of the meat. We continue to use this procedure for purpose of obtaining press filler for analysis. We determine total nitrogen and non-protein nitrogen, and some times in organic phosphorus in press fluid and that gives a measure of various factors which can be used to correlate with the changes that take place in meat during storage, freezing or aging.

It has some merit for that use, but as an attempt to correlate it with palatability quality of juiciness, I don't think it is much good because of a number of reasons. A variation in the $_pH$ of meat can cause a tremendous difference in the amount of fluid that can be pressed out of it. Ordinarily if you have a normal carcass that is not going to vary much. You will strike the bottom value of the $_pH$ around 5.4 for beef, and there is a greater variation in pork. If you have one that is a little skimpy on lactic acid, as I mentioned a while ago, its $_pH$ will be a little high and it just won't come out and you will not register a corresponding deficiency in the way it tastes when you eat it.

MR. ADAMS: I wonder, then, if it would not be advisable to change the heading of Section E from Juiciness and just call it "Press Fluid," because that is, after all, what we are actually determining as the physical measurement and I think that should clear that up, because if you are going to run some of these tests on the press fluid, there is no reason you should not enter that as part of your data.

MR. AUNAN: Shouldn't that second statement also be changed, "Use of the Carver Press for obtaining press fluid" instead of "measuring" or "extracting"?

MR. ADAMS: Let's change that to extracting.

There is one other thing that I want to clear up now and that is the use of this modified Babcock method. Davey, do you want to take the floor on this and tell us a little about it?

MR. MACKINTOSH: I don't know how much Dr. Hall is going to say this afternoon, but I am going to say from the standpoint of a layman, not a chemist, that statistically the results obtained on the modified Babcock test, using Dr. Hall's classifications are very much more uniform and within a much narrower margin than the standard method of procedure now used.

DR. HALL: I think Davey misunderstood me a little. Dr. Pearson is going to discuss that this afternoon.

There is one other point in this same section. I think it is a matter of wording. No. 1 under fat, "Ether extraction of fat of the ninth, tenth and eleventh rib cut." Do you mean that you are going to extract all of the fat out of that cut with ether?

MR. MACKINTOSH: No, that was just corrected.

DR. HALL: That correction was made on the first page.

MR. MACKINTOSH: I made the correction here. It should be followed up over here.

MR. COLE: I am constantly quizzed by Dr. Warwick, who is the regional beef coordinator, about how we might do a little better job of analysis or evaluation of carcasses without tearing up the carcass too much. In other words, this is the problem they are faced with: They have to sell these carcasses to the packing plants and how can we get the most information maybe from a small sample? For instance, take the twelfth rib. Can we get the chemical analysis and maybe the shear test either from one rib or one of that area that possibly the packer would let us have and then we would not be out too much expense and it will give us a lot of good information.

MR. HANKINS: From my point of view there is only one way to determine that question. That is to set out and accumulate a set of data. It may take considerable data.

While I am on my feet I might say that we have the same question thrown at us more or less -- well, I would say more or less frequently, but when it comes, it is a serious question. We did some work recently on the area of the eye muscle in relation to weight of lean. We also did about the same time work on the thickness of fat over the eye in relation to the weight of the fat. You cannot do anything with percentages there. You get lost. But you can do something with weights. Having estimated a weight of lean and a weight of fat, then, of course, you obviously have a ratio which may be very useful to you between fat and lean, and still from those prime, basic data having a way to get at the weight of the bone. But I think, Bill, that aims in the direction that Warwick has been trying to steer you.

MR. MACKINTOSH: I think we should remember, however, at least it is my recollection, that all our data to date indicates that the usefulness of the Warner-Bratzler shear is limited to the cooked sample and not the raw sample.

Any other changes? If not, do I hear a motion to adopt this?

MR. PEARSON: I so move.

CHAIRMAN BRAY: Second.

MR. MACKINTOSH: All those in favor of accepting this in addition to our standard procedure signify by saying "aye"; opposed. All right, we have adopted another section.

The third part is measuring and grading carcass beef. That is by Mr. Naumann from Missouri.

# # #

A RECOMMENDED PROCEDURE FOR MEASURING AND GRADING BEEF FOR CARCASS EVALUATION*

H. D. NAUMANN
UNIVERSITY OF MISSOURI

By the creation and use of standard methods data is made more comparable whether it be from the same source or widely different sources. Consequently, the Beef Carcass Evaluation Committee is confident that the adoption of procedures such as those which follow will affect greater utility of beef carcass data.

A paper and demonstration on beef carcass measurements were presented at the last Reciprocal Meats Conference. The discussion period that followed the presentation indicated that certain considerations needed clarification. Consequently, the necessary changes have been made to satisfy this need.

The question of a standard cooler shrink was raised last year. A standard shrink of two and one-half per cent of the hot carcass weight is suggested. Since a large majority of the carcass measurement is necessarily done in commercial coolers where it is impractical to obtain cold carcass weights, hot weights must be used to determine the shrunk weight. Weights obtained at the home laboratory may easily be converted, if necessary to the standard shrink. The committee realizes that the recommended shrink does not exactly correspond to all circumstances since there is variation from plant to plant attributible to refrigeration and other influences. It is further recognized that variation is encountered from carcass to carcass depending on fat covering, size, compactness, etc. It is expected, though, that factors such as these will not introduce as much heterogeneity into results, in the aggregate, as failure to use the standard shrink.

The measurements that follow and the outline which has been handed to you in mimeograph form are those recommended. The mimeographed outline has been particularly designed to serve as a guide for workers just initiating investigations of this nature.

Equipment Needed

(1) Flexible steel tape - should be six feet long, have a white background with black numerals and be calibrated in millimeters.

(2) Large outside measuring calipers - twenty or twenty-four inch size is adequate.

---

* A preliminary and more detailed discussion may be found in the Report of Proceedings, Fourth Annual Reciprocal Meat Conference, pp. 89-93, (1951.)

(3) Rigid transparent rule - used in conjunction with the calipers and to make measurements on tracings.

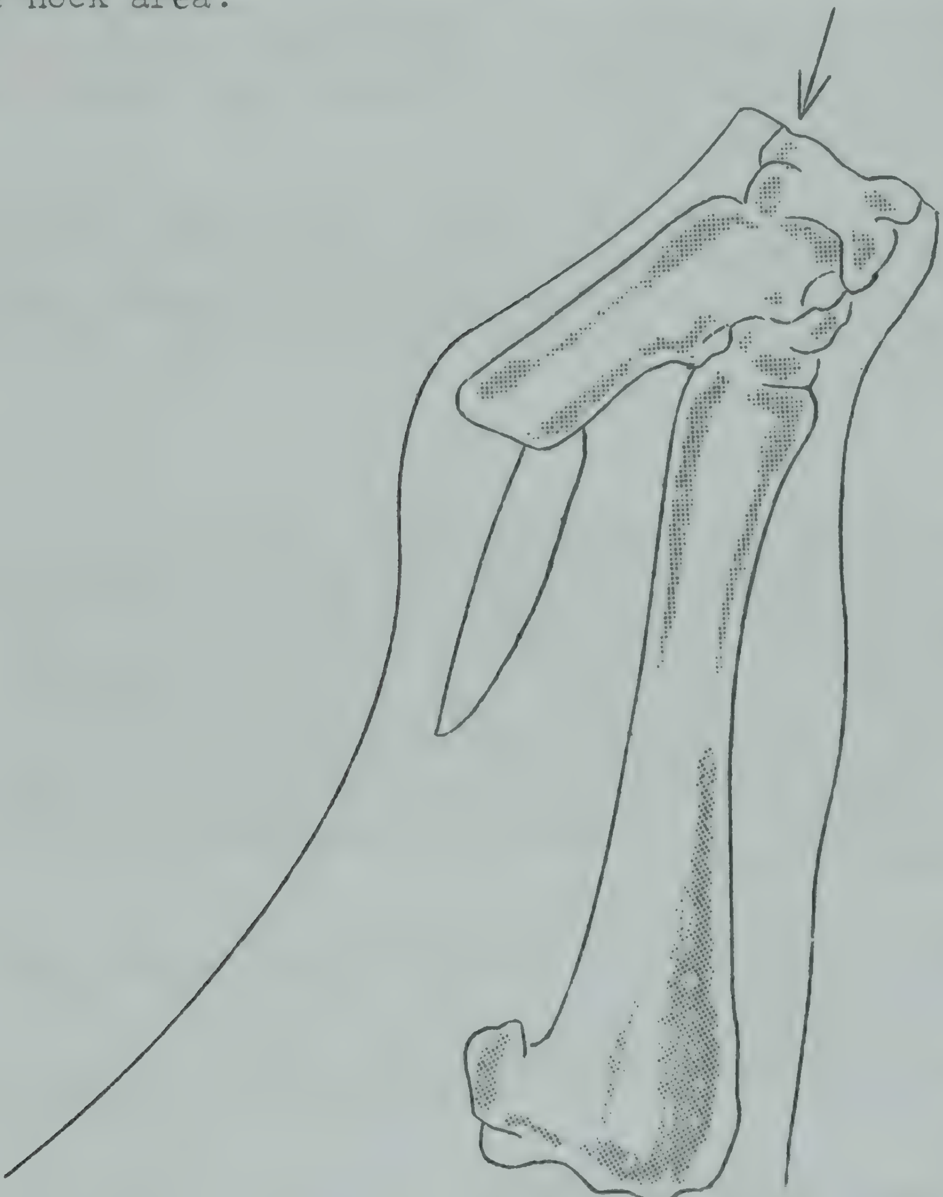
(4) Compensating polar planimeter - for area of rib eye.

(5) Incidentals - a platform or step-ladder, protractor, shroud pins, 173 PTM tracing paper, and an 8 x 11 inch piece of heavy wax impregnated cardboard.

Unribbed Carcass Side

(1) Length of body - Measure from the anterior edge of the 1st thoracic vertebra to the anterior edge (lowest point) of the aitch bone.

(2) Length of hind leg - Measure from the anterior edge (lowest point) of the aitch bone to the highest point on the tarsal bones in the hock joint. This point is indicated on the accompanying diagram of the hock area.



(3) Circumference of round - The circumference of the round is measured by perpendicular to the length of the hind leg measurement sixty percent of the distance from the hock to the anterior edge of the aitch bone. The procedure is to establish a straight line with skewers or shroud pins between the two points used when determining the length of hind legs. Place one skewer (a) exactly sixth percent of the distance from the hock joint to the anterior edge of the aitch bone on the previously established

line. From this point place a skewer (b) on the anterior side of the round along a line perpendicular to the previously established line and another (c) in the same manner on the posterior side of the round. This establishes the three necessary guides (a, b, and c). An 8 x 11 inch piece of wax impregnated cardboard may be used when placing skewers (b) and (c) perpendicular to the length of leg. Measure the circumference by placing a steel tape below these three mentioned skewers and taking a reading after making sure the tape is taut and touching all three skewers.

(4) Depth of body - Measure from the dorsal side of the spinal canal at the 5th thoracic vertebra to the ventral side of the sternum (breast bone) with the tape being held parallel to the floor.

(5) Length of loin - Measure from the anterior edge of the aitch bone (lowest point) to the middle of the 12th thoracic vertebra.

(6) Width of shoulder - Measure from inside the carcass at the first thoracic vertebra to the outside of the shoulder with 20 to 24 inch outside measuring calipers. Hold the axis of the calipers in a median plane to the carcass and parallel to the floor. The sum of the measurements of the right and left side is used.

(7) Width of round - Measure with the calipers from inside the carcass at the highest point of the aitch bone to the outside of the round. Hold the axis of the calipers in a median plane to the carcass and parallel to the floor. The sum of the measurements of the right and left sides is used.

Ribbed Carcass Side

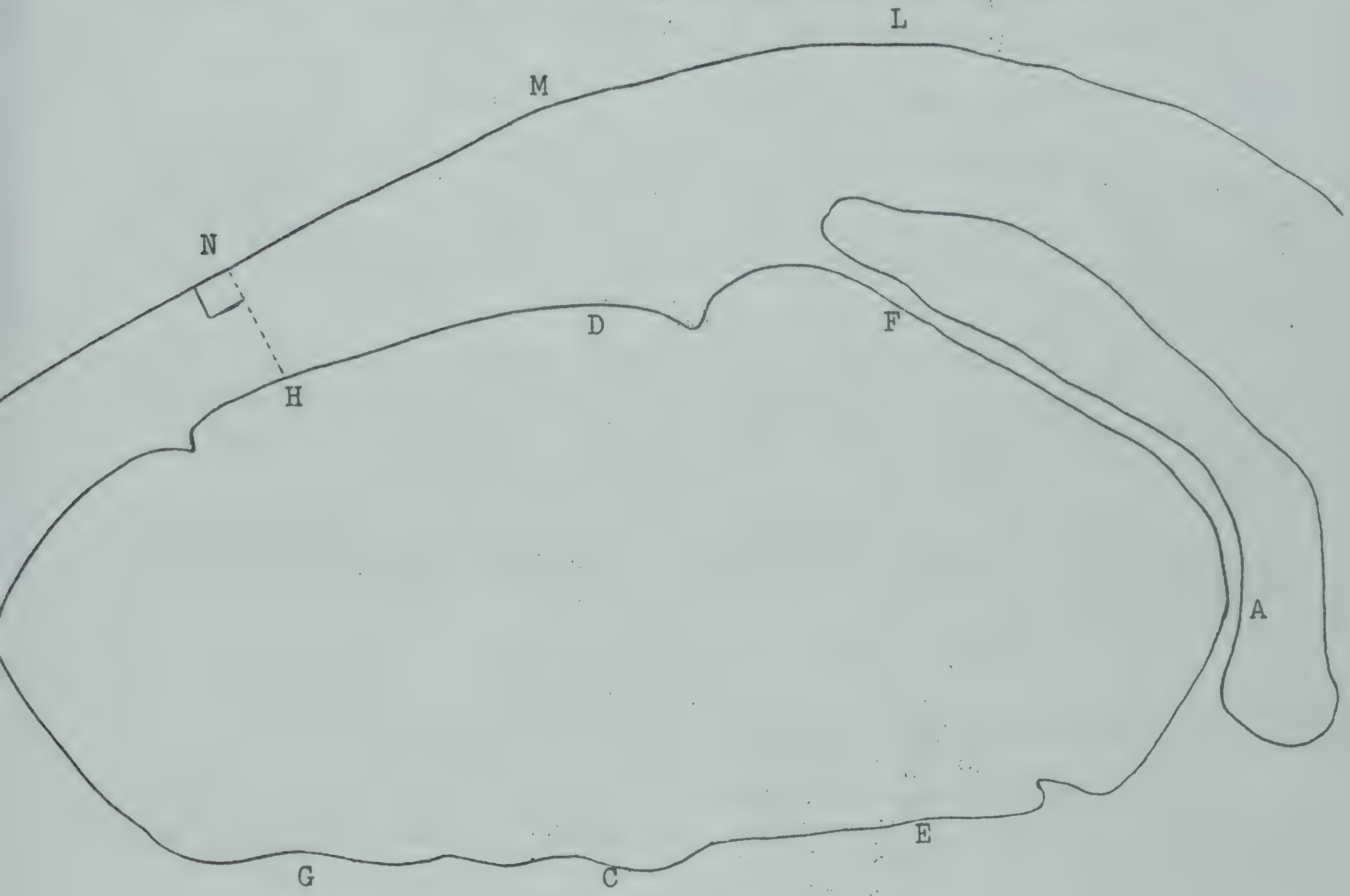
The measurements from the ribbed carcass side are designed to characterize the eye muscle (longissimus dorsi) and the adjacent external fat of the 12th rib. The measurements are customarily taken from a tracing of this portion of the carcass because it is difficult to take the measurements directly from the rib cut. The tracing should be made on a transparent non-absorbent paper which has a suitable surface for writing. PTM-173 tracing paper meets these specifications. A sharp pointed lead pencil should be used when making the tracing. The eye muscle and the external fat covering are traced as indicated in the accompanying diagram.

(1) Area of eye muscle - Follow the outline of the eye muscle with a compensating polar planimeter.

(2) Length of eye muscle - This is the distance along the long axis of the eye muscle (AB).

(3) Width of eye muscle - Three measurements are averaged for the width of eye muscle. The first (CD) is made perpendicular to the line used in determining the length of the eye muscle at a point one-half the length of the eye. The second (GH is parallel to the first at a point one-fourth the length of the eye muscle from the ventral edge of the eye muscle. The third (EF) is parallel to the first at a point one-fourth the length of the eye muscle from the dorsal edge of the eye muscle.

(4) Width of fat - Measure from the outside of the fat where the surface of the fat is perpendicular to the three points on the outside of the eye muscle that were used to determine the width of eye measurement. The three measurements may be averaged or used independently.



The carcass should be ribbed between the twelfth and thirteenth rib with the knife held perpendicular to the carcass and following the contour of the twelfth rib. The shape and size of the ribeye may be greatly altered by the manner in which the carcass is ribbed. Every effort should be made, therefore, to insure standardized ribbing.

Subjective Scoring

All carcasses should be graded to the nearest one-third federal grade and scored on a U.S.D.A. Beef Carcass Grading Chart. The grade should be determined by a committee of government graders with the scoring done by at least one member of this committee. In such cases where it is necessary or desirable to have someone other than a government grader fill out the grading chart this person should also serve as a member of the grading committee.

- - - - -

MR. MACKINTOSH: Are there any recommendations for changes?

I might say here that two or three persons have mentioned to me during the past year or cited the measurements and some of the routine analyses recommended by the North Central Cattle Breeding group. I do not know whether to like that or not. There are at least five men in this room here who were present when that was prepared. I do not know whether we should refer to those or not because, after all, that was condensed from other sources and put together there. I still think it is a good source of information because they have it in mimeographed form.

Are there any suggestions?

MR. MARGERUM: In taking the measurement or the circumference of the round, I think it is rather difficult to get the tape uniformly taut. I was wondering if it would not be possible and advisable to have a guide point on the outside of your round as well as the three points already indicated.

MR. MACKINTOSH: We have done that somewhat with ours. This past week in Kansas City we did that. We used a little longer rule and the three scores were a little farther apart. It was kind of hard to measure, but in my opinion if you can do it, it is desirable.

Are there any other comments? All right, the committee is asking for your approval of this outline of standard procedure for measeasuring beef carcasses.

MR. KEMP: I move that it be approved.

(The motion was seconded.)

MR. MACKINTOSH: It is moved and seconded that this be approved and added to our standard procedure. All those in favor signify by saying "aye"; opposed. (Carried)

Our next paper is by Dr. Clifton, of Iowa State College. He is going to give us an illustration of what can be done with this last tool that we have been discussing, carcass measurements. I think I can say at this time that we hope you will shoot it full of holes or endorse it to some degree. It is the first material prepared for publication. I think it is ready for publication, is it, Mr. Clifton --using measurements as a means of acquiring information related to grades of beef -- and Mr. Clifton has consented to tell us about the work he has done during the past two or three years. It is a sample of what is being done at two or three other institutions, but this is prepared. I am very happy to introduce Dr. Clifton to this group at this time and I am glad that he consented to come down here.

# # #

SOME BEEF CARCASS MEASUREMENTS AS RELATED TO GRADE

E. S. CLIFTON
IOWA STATE COLLEGE

The problem of grade standards is one that is particularly intriguing. Since the beginning of time, man has undoubtedly wondered just what the properties are that make certain foods desirable. What is it that determines the difference between an average and a delicious food?

There are multitudes of chemical and physical properties that affect a person's evaluation of a food product. Just what are these properties? How do you measure them? It must be remembered that the like or dislike for a particular food is almost the ultimate in subjectivity. Foods are tasted, smelled, felt and seen. To some extent these properties defy measurement. An individual can rank foods according to his likes or dislikes, but it is highly improbable that he can tell how much better one product is than another one.

Nevertheless, when grade standards are set up, the attempt is made to generalize not only on the magnitude of these subjective values, but also on the degree and amount of interrelation between these different values.

The purpose of this paper is to discuss one attempt to empirically test what, if any, relationship exists between certain carcass measurements and the grades of those carcasses.

The adequacy of the existing United States Department of Agriculture's Carcass Grade Standards in measuring these subjective values was outside the scope of this study.

At this conference last year, Professor Naumann gave an excellent paper entitled, "A Recommended Procedure for Measuring and Grading Beef for Carcass Evaluation." A refinement of these measurements was presented just previous to this paper. Thus, it will not be necessary to reiterate them.

Additional information collected included:

(1) warm carcass weight

(2) color of the eye muscle (using Munsel color paddle)

(3) beef carcass grading chart filled out by government grader.

The sample used in this study was stratified by 50 pound weight groups and one-third government grades. Approximately 6 carcasses were included in each cell. The 355 steer carcasses were measured in a cooler at a Chicago packing plant.

The contemplated method of analysis for this study was regression. To make this type of analysis, it was necessary to code the government grades into numerical values. The values used were those on the beef grading chart. The coded numbers were:

Upper third of prime - 2

Middle third of prime - 4

Lower third of prime - 6

Etc.

The data were taken during 1950 and the grades used were those in effect at that time.

Coding in this manner assumes that the physical variations within and between one-third government grades are linear and constant. A second assumption made was that the grader graded the carcasses to the nearest one-third government grade without error. The normal assumptions for regression analysis were made also. It is doubtful if any of these assumptions are completely valid.

The first step in the analysis was to correlate the individual measures with grade. Ranked in order of their simple correlation coefficients these measures are:

Measure*	Correlation Coefficient
Width of fat on eye (HN)	.77
Width of fat on eye (average)	.72
Length (total)	.71
Weight (warm carcass)	.65
Length of loin	.54
Width of shoulder	.40
Width of round	.30
Depth of body	.30
Circumference of round	.20
Rib eye area	.10

A second step was to relate some ratios to grade. The ratios used and their correlation coefficients are:

Measure	Correlation Coefficient
Weight-length (weight divided by length)	.78
Index of plumpness (circumference of round divided by length of leg)	.48
Rib eye Index (CD divided by AB)	.30

The next step in the analysis was to combine these several measures into a multiple regression equation to see what combination of measurements could be used to predict grade. There are two possible approaches to this problem. One would be to put all these variables into a single equation and drop out the ones that prove to add little or nothing to the equation. Another one is to select those measurements which are thought to be most clearly related to grade and then to add the others testing whether or not they would contribute additional information to the equation. The latter method was the one used in this study.

---

* For location of these measures refer to preceding paper by Mr. Naumann.

The measurements selected were: total body length,weight, fat measure (HN) and the fat measure (HN) squared.

A very brief sketch of why these measures were selected follows:

Weight and length: Weight and length combined gives a measure of the conformation of the animal. It also gives some indication of the quality and finish of the animal in the sense that the fatter the animal of given conformation, the more weight you have per unit of length. Weight and length were used separately in this study although weight-length ratio would have given about equal results. The ratio was not used in this study because it requires a more complicated analysis and it requires additional statistical assumptions.

Fat measure: The selection of the lower fat measure is one that may be subject to some controversy. It was selected because cattle on feed seem to fatten from the top of the back down the sides. Thus, this measure would tend to be an indicator of short and full feeding. It is believed by the writer that weight and length are better indicators of the lower grades of beef carcasses than of the better grades. Thus, the measure which would help weight and length predict most in the better grades would be the best measure to use.

When this fat measure was plotted against grade, the relationship appeared to be a first degree curve. This would be expected since fat is deposited at a decreasing rate as the animal is fed for longer periods of time.

The use of any fat measure is an attempt to get an estimate of the quality of the meat and to some extent a measure of finish. This measure implicitly implies that the quantity of fat surrounding the eye muscle measures the amount and dispersion of fat within the eye muscle. Although this relationship probably exists in general, in many instances, this assumption is extremely fallacious.

The least squares method was used to estimate the parameters of the equation. The resulting equation was:

$$y(\text{grade}) = -13.32 - .0229(\text{weight}) + .0258(\text{length}) - .664(\text{fat}) + .0102(\text{fat})^2.$$

The multiple correlation coefficient was -.898.

The standard error of estimate was 2.4.

In general, from these results, you might conclude that the error in estimating grade from these measurements would be less than one-third of a government grade two-thirds of the time.

Each of the other measures were used in addition to these measures but failed to add much to the prediction equation.

The failure of other measures to have their expected influence on grade is as important as the positive results of this study. The most disappointing of these measures was area of eye muscle and Index of eye muscle. For years these measures have always been referred to as Prime determinants of grade; yet, they were useless used either singly or in combination with other factors in this particular study. This is somewhat confusing since it is often said that anyone can tell grade if they can see the eye muscle. It may be that the correct way of measuring the pertinent characteristics of the eye muscle was not used in this study.

Some index of the area of the eye muscle and the amount of fat surrounding this muscle might be a better measure to use.

Other factors that were disappointing in this study were the plumpness of the hind quarter, length of loin and color of the eye muscle. The failure to have equal exposure time and other problems of measurement may be the reason that color was of little value.

Professor Anderson defined an economist the other morning. I would like to use another definition -- one that is more appropriate just now. It has been said often that if all economists were placed end to end, they would never reach a decision.

This is applicable here because I do not know whether one can say that these results indicate that the graders consistently use the factors mentioned when predicting grade or whether these factors are related to some other factors that they do use.

It is to be emphasized that this is only one study consisting of 355 observations. The study was done under commercial operations. It is only a start and can in no way be termed conclusive. The work needs duplication and refinement before it will be possible to adequately evaluate whether or not grade standards based upon measurements can ever be developed for beef carcasses.

This conference has done some excellent work in supplying the tools for obtaining comparable data to analyze in grade evaluation work. I hope that this report may indicate some of the ways that this information may be analyzed and that it may serve to help direct future research in this area.

- - - - -

MR. MACKINTOSH: I am sure that Dr. Clifton and all of us will appreciate any questions that you wish to ask.

MR. NAUMANN: I have a question that might be appropriate, although a little late. As I remember, last year this conference went on record as recommending the use of a sixth of a pound in weight and the measurement being in millimeters or centimeters. Is that correct?

MR. MACKINTOSH: That is correct.

MR. NAUMANN: I think in view of that we should change this slaughter procedure to correspond with that.

MR. MACKINTOSH: If I might read an abstract from a biennial report of this project at Kansas City. I have copied this from there and it can be incorporated into whatever is printed. It can be incorporated without question, if desired. It reads as follows:

"At the Kansas Experiment Station, a cooperative project between the Department of Agricultural Economics and the Department of Animal Husbandry related to Marketing Slaughter Livestock by Carcass Weight and Grade has been in progress for several years. During the past two years the activities have been related to observations pertaining to carcass measurements and U. S. beef grades.

Measurements of important physical characteristics, thought to be related to grade, have been completed for approximately 265 beef carcasses. A preliminary analysis was made of the relationship of these measurements to carcass grade on 192 carcasses. Simple regression analysis showed that the best indicators of grade were carcass width, weight, plumpness of round and thickness of fat over the eye muscle.

Multiple regression analyses showed the variables, weight, and thickness of fat over the eye muscle combined to be significantly related to grade. The graders descriptive carcass evaluation gave a higher relationship to grade than carcass measurements, probably because the grader tended to choose the descriptive terms which would justify the grade.

During the past year observations on an additional 200 carcasses have been made. In the case of this additional number, the descriptive terms or the descriptive evaluation has been made by a number of the college team and the grade and description of marbling supplied by the regional supervisor of the grading service.

One of the questions concerning the feasibility of the carcass weight and grade method of marketing cattle is whether or not the carcass grade can be determined in an objective manner, so that disagreement over grade between buyer and seller can be avoided. Even though animals continue to be purchased on a liveweight basis, objective standards for the beef trade would facilitate marketing."

MR. MACKINTOSH: This of course concludes the beef program and as usual with anything with which I have to do, has run over time. But I want to thank Dr. Clifton for coming down here and giving us an illustration of how we may use some of the tools that we have adopted. I hope that our future conferences will bring many more from among our own number as well as from among the outside.

CHAIRMAN BRAY: Thank you, Dave and your committee, for the fine presentation. I know that we are running late but I believe it is desirable for us to finish up this report.

I will now turn it over to Bill Cole.

# # #

PORK CARCASS EVALUATION COMMITTE

1. J. W. Cole, Chairman
   University of Tennessee, Knoxville, Tennessee
2. W. J. Aunan, University of Minnesota, St. Paul, Minnesota
3. L. J. Bratzler, Michigan State College, East Lansing, Michigan
4. R. L. Hiner, B.A.I., U.S.D.A., Beltsville, Maryland
5. M. H. Kerr, University of Maryland, College Park, Maryland
6. E. A. Kline, Iowa State College, Ames, Iowa
7. C. L. Strong, Standardization & Grading Division,
   P.M.A., U.S.D.A., Washington, D. C.
8. George Wilson, University of Wisconsin, Madison, Wisconsin

INTRODUCTION

No attempt has been made in this report to go into great detail concerning any of the various phases of pork carcass evaluation. It is the aim of the committee to help standardize some of the practices and procedures that are being carried on differently at various stations in order that data may be compared easily. Such things as scalding and dehairing operations have been left out entirely. Although important, they would not affect evaluation like for instance style of slaughtering or of removing the ham. If standard procedures for slaughtering, cutting and measuring can be adopted by all Experiment Stations doing pork carcass research, the existence of this committee will be justified.

We wish to acknowledge the assistance of Dr. W. A. Craft and his Committee as well as many other individuals for their help and suggestions.

# # #

REPORT OF THE PORK CARCASS EVALUATION COMMITTEE

SLAUGHTERING AND CHILLING PROCEDURES

Much excellent pork carcass information has been obtained with the aid of packing plant cooperation. There is a limit, however, as to the extent and amount of data due to their mechanized operations. With this in mind the committee has recommended the following standard slaughtering procedures:

1. Weighing

   (a) weight when taken off feed

   (b) weight at 18-24 hr. shrink (with water and without feed)

2. Dressing percent

   (a) figured on kill weight after 24 hour chill

3. Method of slaughtering

   (a) head off - leave jowl on carcass, weigh head removed.

   (b) leaf fat left in carcass and figured as part of carcass (kidney removed - not weighed).

   (c) ham facing left on carcass and figured as part of carcass.

   (d) a combination method is suggested where it can be done in your own meats laboratory. This method differs from that described in (a), (b), and (c) in that the head is left on and split at the time the carcass is split. By simply weighing the carcass (or side) with the head on, then removing and weighing with the head off and jowls attached to the side, all yields could be figured on either style of dressing and better yet, on both styles.

4. Chilling

   Chill (34-36°F) and weigh at end of a 24 hour and 48 hour chilling period, if carcass are not cut until after a 48 hour chill.

5. Cutting

   Cut when thoroughly chilled or as soon as possible after complete chilling, after 24 hours provided the internal ham is 38°F or lower.

CUTTING PROCEDURES

The following procedure was recommended by the committee for carcasses from live hogs weighing 200 to 220 pounds. It was thought that some variation may be taken when cutting carcasses from heavier hogs.

(a) Rough shoulder - taken off between 2nd and 3rd rib at the attachment of the thoracic vertebrae and at right angles to the general line of the back.

1. Trimming rough shoulder

(a) lift neck bones

(b) cut off brisket flap and jowl parallel to shoulder cut

2. Skinning full shoulder

(a) collar 1 inch below exposed ventral edge of blade bone exposing false lean on boston butt

(b) cut foot from shoulder 1/2 inch above knee joint or Separate shoulder into picnic and boston butt by cutting 1/2 inch below exposed blade bone and at right angles to the shoulder cut.

(b) Remove ham

(1) remove ham between 2nd and 3rd sacral vertebrae and perpendicular to the line of the shank

(2) remove flank corner and tail bones. Follow natural seam on flank

(3) collar ham leaving 1/3 of skin up from hock joint, leaving approximately 3/8 inch fat or ham.

(4) cut foot off at hock joint

(c) Separate rough loin from rough belly

(1) divide along a straight line made by snugging tenderloin muscle at posterior end of loin and just missing the ventral portion of the back bone at the anterior end of loin. Make this cut with the flat side of the blade bone parallel to the table. It may be necessary to follow the natural curvature of the backbones.

(d) Remove fat back from loin leaving 1/4 inch of fat over loin.

(e) Remove spare ribs from belly by splitting the secondary flank muscle along center line removing most of the soft cartilages from the belly.

(f) Trim belly (flatten out flank end)

(1) cut through teat line

(2) cut off flank at boot jack

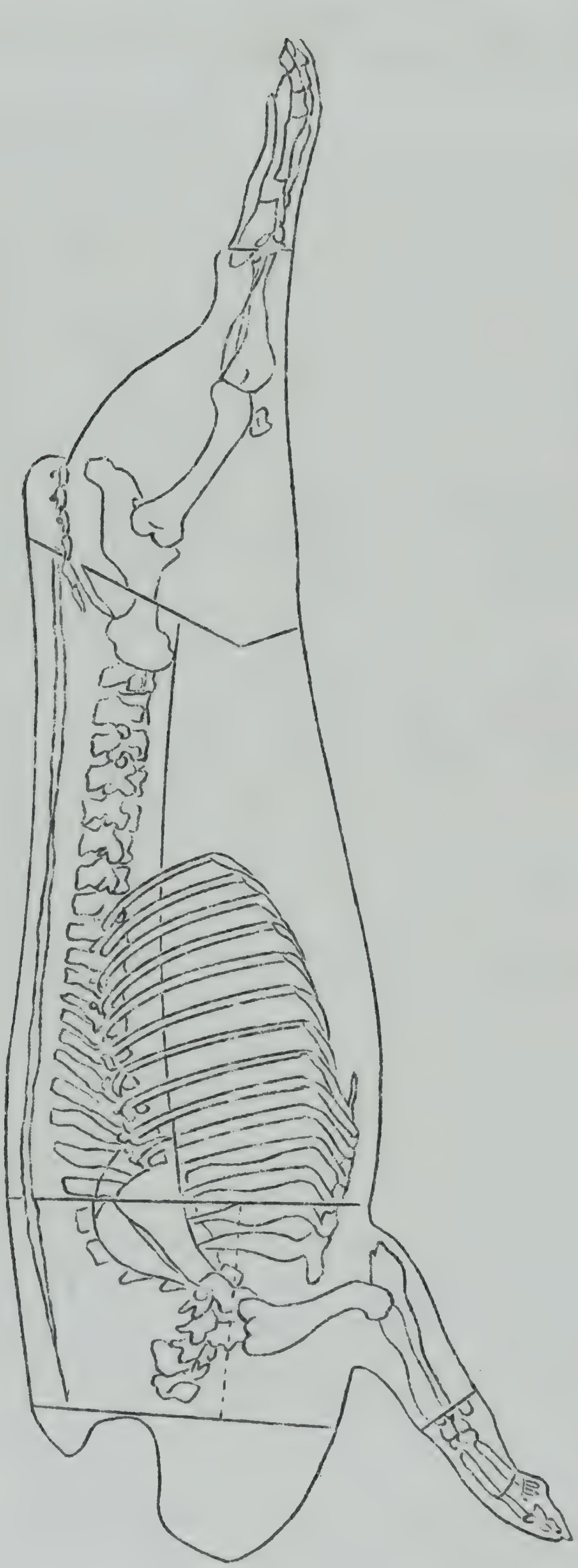
(3) square other two sides if necessary

All cuts should be weighed to the nearest 1/10 pounds. Rough cuts as well as trimmed cuts may be weighed.

# # #

PORK CHART

LOCATION, STRUCTURE AND NAMES OF BONES



"STANDARD METHODS OF MEASURING AND GRADING FOR PORK CARCASS EVALUATION"

Appropriate measurements are valuable aids in pork carcass evaluation, for they add information which is useful in making the final analysis of a carcass. The objective approach that is possible through the use of measurements contributes to the accuracy of comparisons, not only at the time the carcasses are available but also in the data compiled for further study. The advantages of uniformity and accuracy in making and recording measurements are obvious--without accuracy and uniformity from one time or place to another the measurements are meaningless. It seems that the very purpose of taking measurements, to gain useful information, suggests the use of only those which are pertinent to carcass evaluation. Considerable research over a number of years has been directed toward determining which measurements are most important, and those suggested have been generally found most useful to accurate carcass appraisal. Certain measurements are recommended as the minimum information of this kind required; others are listed as optional steps, recognizing that varying conditions in regard to scope of the work, particular need for and usefulness of the information, as well as availability of facilities for obtaining the measurements often dictate which measurements will be used.

Recommended measurements - linear measurement in metric system and weight to 0.1 pound.

1. Length of carcass - measured from the anterior edge of the aitch bone to the anterior edge of the first rib near the vertebrae. On carcasses unevenly split, the measurement should be taken on the side with the most bone.

2. Thickness of back fat - four measurements, made opposite the last lumbar, the last thoracic, seventh thoracic and the first thoracic vertebrae are used either singly or for average thickness. The purpose of the study will determine if the skin is to be included in fat back measurements. Research study - doubtful if skin should be included.

Optional measurements -

1. Area of eye muscle - obtained from planimeter readings of a tracing of the eye muscle taken immediately posterior to the last rib.

2. Length of hind leg - measured from the anterior edge of the aitch bone to the hoof head.

3, Length of ham - measured from the anterior edge of the aitch bone to the center of the bony projection on the inside of the leg at the hock joint.

4. Circumference of ham - measured midway between the two points used in length of ham measurement. The line to follow around the ham is established by inserting skewers at points on the inside, flank side and tail side of the ham one-half the distance of length of ham from the center of the bony projection of the inside of the leg at the hock joint.

5. Width of carcass - a total of two measurements, one of each side, of the distance from the split surface of the main body of the seventh thoracic vertebra to the outside surface of the carcass. The measurement is made along a line perpendicular to the median plane of the carcass.

6. Depth of carcass - the total depth of carcass, including skin, across the seventh thoracic vertebra.

7. Thickness of belly pocket - measured at the thinnest point in the rear flank region by penetration with a skewer or other suitable device.

8. Thickness of fat on the regular ham - with the ham lying skin side down on a table, measure the thickness of external fat and skin across the cut surface of the butt end of the ham at a point directly beneath the cross section of the hip bone exposed in removing the ham from the side.

Grading is another method of identifying differences between carcasses and an aid to accurate pork carcass evaluation. It is perhaps a less specific method of describing and comparing carcasses than may be accomplished by more complicated procedures. However, grading is a practical method of pointing out differences, and in many cases grades provide sufficiently restrictive categories for the purpose.

The tentative grades for barrow and gilt carcasses proposed by the United States Department of Agriculture are recommended for use in a standard evaluation procedure. Corresponding grades for slaughter barrows and gilts provide a key to the identification of associated live and carcass characteristics. The grades are designed to reflect differences in yields of lean cuts and of fat cuts and in quality of meat. The Choice grade includes carcasses with sufficient finish to produce cuts normally acceptable as Choice quality, and Choice No. 1, Choice No. 2, and Choice No. 3 grade carcasses all have similar quality characteristics. However, yield of lean cuts decreases and yield of fat cuts increases in proportion to increasing finish from Choice No. 1 to Choice Nos. 2 and 3. Medium grade carcasses are somewhat underfinished with a resulting lower quality of cuts than Choice carcasses. The Cull grade represents decided underfinish with cuts of very low quality normally suitable only for use as processing pork.

Measurements of average back fat thickness in relation to either weight or length of carcass are used as objective bases forthe grades and to serve as guides to aid in the uniform and accurate interpretation of the standards. Application of the standards in grading carcasses involves consideration of either visual or actual measurements as well as other characteristics described in the standards.

Use of carcass grades in evaluation will serve the purpose of identifying some of the major differences common among pork carcasses. At the same time, live grading may be used to link the carcass characteristics to differences in the live hogs. Further refinement of the analysis may be accomplished through the use of measurements, cutting, and other more detailed procedures.

SLAUGHTER RECORD

Most of the Experiment Stations doing carcass research work with swine were contacted, and we received about as many different forms as stations reporting. There seems to be no one data collection sheet that is best for all occasions. The nature of the investigations will determine the kind and amount of information needed. However, the following items should be considered in planning a slaughter sheet:

- Date and time of slaughter
- Breed, sex, and age
- Time taken off feed
- Weight at end of feeding trial
- Kill or live weight at slaughter
- Total viscera weight
- G. I. tract weight
- Edible organs and glands: Liver, heart, tongue, kidney
- Ruffle fat
- Head weight (if removed)
- Hot carcass weight
- Cold carcass weight
- Dressing percentage
- Color of lean
- Firmness of fat
- Measurements:
    - Length of carcass
    - Backfat thickness
    - Area of eye muscle
    - Others
- Miscellaneous
- Comments

A few data forms are included.

HOG CARCASS CUTOUT TEST
Minnesota Station

NAME ADDRESS DATE

TATTOO NO. EAR TAG NO. BREED OR X

LIVE WEIGHT STO. INTEST WT. ADJ. FOR FILL

ADJ. LIVE WT. CHILLED CARCASS WT. YIELD

LENGTH OF SIDE FAT THICKNESS: 1. 2. 3. Av.

DISTANCE HAULED AGE

	WEIGHT				PRICE	AMOUNT	
	LBS.	OZS.					
Skd. Ham				%			
Regular Picnic							
Boston Butt							
Regular Loin							
Regular Trimmings							
Sq. Cut Seedless Belly							
D S Jowls							
Fat Trim. (Fatback Included)							
Sp. Ribs							
Neck Bones							
Fore Feet							
Hind Feet							
Tail							
Cutting Shrink							
TOTAL							

HOG CARCASS DATA

Oklahoma Agricultural Experiment Station
Animal Husbandry Dept.

DATES: Slaughtered ____________ Water weighed ___________ Cut ______________

PIG NO. _______________ TATTOO __________________ SEX _______________

Wt. on feed ____________________ LINE ______________

Shr. live wt. __________________

Hot carc. wt. __________________ Killing fat ________________

CARCASS MEASUREMENTS

	L. Side	R. Side
Backfat, 1st. rib		
Backfat, 7th rib		
Backfat, last rib		
Backfat, 6 lum.		
Length		
Length hind leg		
Width loin eye		
Depth loin eye		

SUMMARY

Carcass length __________________

Av. Backfat __________________

Loin lean area __________________

Spec. Grav. __________________

% Lean cuts (3) _________________

% Primal cuts _________________

Carcass score _________________

Carcass index _________________

WEIGHTS

	L. Side	R. Side	Both Sides	% Shr. l. wt.	% Carc. wt.	Rel. value	Score
Ch. carc. wt.							
Carc. wt. in water							
Sk. ham							
Tr. loin							
Sk. shoulder							
Tr. belly							
Fat trim & skin							
Leaf fat							
Lean trim							

PORK SLAUGHTER AND CARCASS YIELD RECORD

Animal Husbandry Meats Laboratory
University of Tennessee

Date ____________

Slaughter Identification ____________ Market Class ____________

Grade ________ Purchase wt. ________ Price ________ Total Cost ________

	Wt.	Price	Value
Liver			
Heart			
Head Trimmings			

Dressing & Handling Cost ____________

By-Products Credit ____________

Total Carcass Cost ____________

Price Per Pound ____________

	Left	Right	Weight	% of Kill wt.	Price	Amount
Weight of Side						
Trimmed Ham						
Regular Ham						
Loin						
Fresh Side (Belly)						
Boston Butt						
Picnic Shoulder						
Full Shoulder						
Trimmed Jowl						
Spare Ribs						
Lean Trim						
Fat Back						
Fat Trim						
Clear Plate						
Feet, Tail, Kidney						
Neckbones						
Rendered Lard						

MEASUREMENTS

Back Fat
1st Rib
Last Rib
Last Lumbar
Length
Depth
Width
Firmness
Color

Inspector's Report: ____________ ____________

A.H. 359 ____________

PHYSICAL, CHEMICAL AND ORGANOLEPTIC METHODS OF PORK CARCASS EVALUATION WITH SPECIAL REFERENCE TO FIRMNESS AND COLOR

Firmness

It appears that the penetrometer is the instrument of choice in measuring firmness. It offers a method for the routine analysis of fat samples which does not involve chemical analysis, which are as a rule time consuming. Values obtained with this instrument have been found to be highly correlated with the degree of firmness (as determined manually), refractive index, iodine number, and melting point. Hiner & Hankins have proposed the following standards for the use of the penetrometer: Hard 0-21, Medium Hard 23-33, Medium Soft 34-38, Soft 49-70, and Oily 71 and over. These values were established for the penetrometer under a standard load (including the needle, test rod, and added load) of 255.65 gms., using a needle three inches long with a working end 0.15 inches in diameter and allowing the needle to penetrate the sample for 15 seconds. The samples were cut to fit inside a sample box 3 by 3 by 1 inches. All carcasses were chilled for approximately 72 hours at 33° to 35° F., and the tests carried out in a room at the same temperature. Further details can be found in: Journal of Agricultural Research, Vol. 63, No. 4, pp. 233-240, August 15, 1941.

Color

Although many color measuring instruments have been adapted for use on meats, few of them have proven to be entirely satisfactory due to the nature of the sample. It is evident that where the human factor is involved between station variation will be great and within station variation cannot be entirely eliminated. It is believed that the Spectrophotometer, the Color Comparator, the Munsell discs, and the Munsell color paddles reduce this error considerably. The use of the Hunter Color Difference Meter offers a more objective method of measuring color, in which the human error is greatly minimized. This Color Difference Meter can be applied to the routine color analysis of meat samples and would give results which would be comparable between stations. This meter has one disadvantage, in its price, and hence it has not been widely used. If this instrument were available to more stations, it appears to be the method to choose as standard. Information on this instrument may be obtained by writing H. A. Gardner Laboratory, Inc., 4723 Elm Street, Bethesda 14, Maryland.

SOME NEW TECHNIQUES

Carcass Specific Gravity Procedure

The procedure for determining hog carcass density or specific gravity is a simple one. The chilled half carcass is weighed to the nearest .1 pound on a pair of Toledo springless scales to obtain the chilled air weight. A cylindrical galvanized tank, seven feet tall and 30 inches in diameter, is filled with water and raised on the elevator from the basement so that the open top of the tank is raised about a foot above the level of the slaughter floor. A table is placed across the elevator shaft and a Toledo balance scale placed on it. The scale is located near enough to the edge of the table to allow a string on which a hook is suspended to swing free of the table edge. The string is tied to an arm of the scale weighing platform and the scale balanced with the hook immersed in the water. The half carcass is completely immersed in the water suspended from the hook and the water weight recorded to the nearest .01

The specific gravity or carcass density is calculated by dividing the air weight of the carcass by the air weight minus the water weight. The quotient is carried to the third decimal place. Specific gravity values have varied from 1.008 for very fat carcasses to 1.062 for very lean carcasses.

PRICE INDEX FOR PORK PRIMAL CUTS

Percent yield of trimmed ham on shrunk live weight x 1.02 ______
" " " " loin " " " " x 1.00 ______
" " " " shoulder " " " x .74 ______
Carcass value (Sum.) ______

The trimming of the cuts eliminates any tendency of getting an index value too high because of overfinished or excessively fat hogs. If any system of grading is used prior to slaughter or after slaughter we should eliminate any tendency of a high index value because of the production of hogs that are too lean or underfinished. The numbers (1.02, 1.00 and .74) are the relative prices of these cuts with the price of the loin equal to 1.00. The prices were determined from the "National Provisioner" for the period 1946-1950 using weekly Chicago wholesale prices.

This index ma6 not be the final answer but it has compared very favorably with more complicated indexes in use at this and other stations.

Attention is called to the following:

Mechanical measurement of fatness and carcass value of live hogs. L. N. Hazel and E. A. Kline.

A method for measuring the proportion of fat and lean tissue in swine carcasses. W. J. Aunan and L. M. Winters.

Both described in Journal of Animal Science Vol. II #2, 1952.

PRICE SUMMARY

1946-1950

Chicago	1946	1947	1948	1949	1950	Total	Av.Price
Skinned hams	X358.0	2167.6	1849.5	2315.4	2268.8	8959.3	
	X̄44.75	51.61	48.67	46.31	45.38	-	47.66
	N8	42	38	50	50	188	
Skinned shoulder	X1099.2	1851.5	1333.5	1731.2	1670.3	7685.7	
	X̄26.17	35.61	39.22	33.95	33.41	-	33.56
	N42	52	34	51	50	229	
Boston butts	X1204.2	2047.5	2099.0	1684.2	1893.5	8928.4	
	X̄30.11	41.79	43.73	37.43	37.87	-	38.48
	N40	49	48	45	50	232	
Picnics	X1008.2	1440.3	1508.5	1128.7	1483.0	6568.7	
	X̄24.00	34.29	36.79	29.70	29.66	-	30.84
	N42	42	41	38	50	213	
Loins	X1322.8	2395.0	2490.5	2385.4	2239.1	10832.8	
	X̄32.26	50.96	51.89	45.87	44.78	-	45.52
	N41	47	48	52	50	238	
Cured bellies	X981.0	3138.8	2825.0	2429.3	1931.9	11306.0	
	X̄31.65	61.55	58.85	46.72	38.64	-	48.73
	N31	51	48	52	50	232	
Sausage bulk	X709.8	764.5	1744.5	1870.0	1927.0	7015.8	
	X̄27.30	44.97	43.61	36.67	38.54	-	38.13
	N26	17	40	51	50	184	
Lard	X447.7	1167.7	974.9	587.0	592.5	3769.8	
	X̄15.99	22.46	20.31	11.29	11.85	-	16.39
	N28	52	48	52	50	230	

New York (City)							
Regular hams	X1212.0	2577.0	2278.9	2395.0	2021.5	10483.5	
	X̄31.08	51.54	50.62	46.06	47.01	-	45.78
	N39	50	45	52	43	229	
Skinned hams	X1094.0	2113.0	1580.0	1453.5	2377.5	8618.0	
	X̄31.26	54.18	52.67	48.45	47.55	-	46.84
	N35	39	30	30	50	184	
Chicago Av. Market (Bellies (fresh	X1006.0	2471.1	2053.0	1725.1	1532.8	8788.0	
	X̄24.54	47.52	42.77	33.18	30.66	-	36.16
	N41	52	48	52	50	243	
(Bellies (cured	X1095.8	2549.5	2138.6	1812.0	1598.6	9194.5	
	X̄26.73	49.03	44.55	34.85	31.97	-	37.84
	N41	52	48	52	50	243	
Regular shoulders	X997.0	1835.0	2072.0	1916.0	1599.0	8419.0	
	X̄27.69	38.23	43.17	36.85	37.19	-	37.09
	N36	48	48	52	43	227	
Loin	X1323.8	2535.0	2494.0	2530.0	2384.0	11266.8	
	X̄33.94	52.81	54.22	48.65	47.68	-	47.94
	N39	48	46	52	50	235	

N - Number of price quotations in each year for individual cuts
X̄ - Average price for each cut for each year.

FUTURE NEEDS IN PORK CARCASS EVALUATION

Histology of Pork

Very little work has been done on the histology of fresh pork. Reported work has been confined mainly to changes occurring during freezing and storage. This is not true of beef which may vary greatly in tenderness. It would appear that measurement and determination of cause of tenderness has been one of the primary reasons for the extensive histological research as related to beef.

Suggestions for histological pork studies are:

1. Effect of rigor mortis on curing -- rapidity, flavor, tenderness and yield.
2. Effect of rapid gains compared with slower gains on the muscle fibers.
3. Preliminary investigations to determine if individual differences are due to breeding or feeding.

SCORING OF PRIMAL CUTS

A standard scoring method for primal cut would be a useful tool in pork carcass evaluation. A method using scores from 1 to 9 with the larger numbers representing the most desirable has been suggested. However, no standard method for gaging quality has been argued upon. Photographic standards offer great promise.

- - - - -

MR. COLE: We have prepared a report and I think most of you have a copy. It was passed out yesterday with the idea and the hope that you might have time to look it over. There are, of course, things in here that we are not proposing for adoption. They are just more or less added and we will take them up as we come to them.

I should like to preface this report by saying that we have not attempted to go into great detail, maybe due to the fact that the product we are working with, pork, has a few more angles, a few more possibilities, a few more retail and wholesale cuts than the others, and so possibly we cannot have complete standards on everything. We have not, for instance, attempted to tell you at what temperature to scald the hogs nor whether or not you should hand scrape them or dehair them, etc., with a dehairing machine. But we have, we think, included more or less the important points that possibly are not standardized the country over.

We are going to start this off with the slaughtering and chilling procedures, and we are going to ask Mr. Hiner to be the main stem on this.

He is going to be answering your questions. We would like to handle this more or less as a panel. I am going to sit down because that is the way most panels operate.

We will assume that you have had a chance to look this over, and this is a simple, one-page statement on slaughtering and chilling procedures. I think the greatest point at issue here is on the method of slaughtering. The matter of taking off feed and shrink has been pretty well taken care of. Taking the head off or leaving it on is something that maybe does merit some discussion.

What do you think about that, Mr. Hiner? Do you think that will work at the Beltsville Station?

MR. HINER: I have seen it tried and I think as far as I know it has been quite successful. That is in the packing plant. There is quite a little knack in dropping the head so that you get your jowls left, I believe.

MR. COLE: Of course, with this combination method it could be recorded as shipper style or it would really be a modified shipper style and packer style, and, of course, the yields and primal cuts could be figured on either or both.

Would you have any comments to offer on this slaughtering and chilling procedure before we put it up for approval?

MR. HINER: No, not at the present time.

MR. COLE: How about from the group? Do you have any suggestions for changes?

MR. MACKINTOSH: In chilling you say to chill 24 hours from 34 to 36 degrees Fahrenheit. Would it not be better to specify a certain internal temperature of the ham?

MR. COLE: I think that is a good suggestion. What internal temperature should we put down as a standard?

MR. MACKINTOSH: The internal temperature of ham should be brought down under 40 in 24 hours.

MR. FRANCIONI: What about a compromise of 38?

MR. MACKINTOSH: I don't know what it should be. We like to get them down there.

MR. COLE: So we would incorporate under No. 4, chilling, that the internal temperature of the ham should reach under 40 degrees in 24 hours. Is that what you want?

All right, any other changes that you think might be essential?

MR. LOEFFEL: Suppose you don't get them down to that temperature Do you wait 12 more hours or what.

MR. MACKINTOSH: Just wait until you get it.

MEMBER: Will you please specify what you mean by complete chilling?

MR. COLE: I think we can say, "Cut when thoroughly chilled 48 hours or as soon as possible after complete chilling as described above." Will that be sufficient?

MR. E. A. PIERCE: I move that the cuts be made at the end of 24 hours providing the internal temperature of the ham is down below the recommended standard. I think it was 40 degrees or 38 degrees.

MR. BUTLER: I second the motion.

MR. COLE: Any discussion? All those in favor of Mr. Pierce's motion let it be known by saying "aye"; those opposed by a like sign. Well, apparently it is passed by a very small number.

Now on this next portion of the program -- by the way, I presume we need a motion on the whole thing to pass on that slaughter procedure.

MR. WANDERSTOCK: I so move.

MR. COLE: Mr. Wanderstock moves that the slaughtering and chilling procedures be approved, that that portion of the report be approved.

MR. ADAMS: Second.

MR. COLE: All those in favor let it be known by saying "aye"; opposed. (Carried)

In the cutting procedures we have practically the same thing as we had last year where it was attempted to demonstrate cutting. Apparently, there was no big disagreement in the statement we presented and it is exactly the same as last year.

Are there any questions concerning the cutting procedures?

MR. HENRICKSON: I wonder if it would be wise to put a definite measurement, from the vertebra process at the point of the last rib to where that line will come down.

MR. MACKINTOSH: That is the suggestion I was going to make. It is not a measurement, but I have found it very helpful and pretty nearly standard. When you lay the carcass on the block when cutting that loin, hold that side so that the flat side of the shoulder blade is parallel with the table. The shoulder blade varies very little. It is in there deep enough so that no matter how the carcass is crowded, it is not influenced one way or another and you have something that is standard on the skeleton.

MR. COLE: In other words, the lower edge of the shoulder blade, the exposed edge of the shoulder blade.

Any other change or suggestion?

MR. KUNKLE: Mr. Chairman, I wonder about the New York shoulder being cut in two, to make a Boston butt and a fresh picnic. Will there be any subsequent trimming or will we be weighing the two pieces and have a typical New York style shoulder?

MR. COLE: No, there will have to be subsequent trimming and that probably should be included. That is under 2 (b).

MR. KUNKLE: That is right.

MR. COLE: And there probably should be something to the effect that some trimming should be done on the Boston butt and picnic. That probably was left out. Would you like to phrase something on that, Mr. Kunkle?

MR. KUNKLE: I would like to leave it simple to myself, but that is up to you folks.

MR. COLE: What would you say would be simple?

MR. KUNKLE: The way it is.

CHAIRMAN BRAY: On separation of the Boston butt from the picnic shoulder one-half inch below exposed blade bone you run into some trouble. You are not going to come at the smallest part of the blade bone every time you cut it one-half inch below the blade bone, or at least that is our experience. We have tried it and many times we get a rather long exposure of the blade bone left in the picnic. But some packinghouse people tell you to use the large arteries that go to the shoulder, as reference points. Also they say, I believe, to cut an inch and a half or an inch and a quarter above them, and you will always come to the small part of the blade bone.

Then another thing, if you are talking about trimming a picnic, commercially, of course, the lip is always removed from the picnic. That is that lip meat that fits around the top of the inside of the picnic.

MR. COLE: All right, we will make those necessary changes, trimming picnic and Boston butt. Any other suggestions for changes? If not, let's entertain a motion that this portion of the report be accepted.

MR. NAUMANN: I so move.

MR. ADAMS: Second.

MR. COLE: All those in favor of it let it be known by saying "aye"; opposed. (Carried)

Standard Methods of Measuring and Grading was Mr. Lowell Strong's portion. He is not here today and Mr. Pierce, of the United States Department of Agriculture, was going to be with us and he is not with us either. These recommendations are exactly as they were given last year, I believe, and demonstrated to you. Do you have any suggestions for additions or changes in that portion?

Briefly, we have suggested only two definite measurements, length and thickness of back fat, and we have recommended that the grading be done according to the United States Department of Agriculture standards.

MR. ZIEGLER: Which standards?

MR. COLE: Choice 1, 2 and 3. Any comments concerning this?

MR. MACKINTOSH: Isn't there any better descriptive term than "boot jack." It is a new one on me.

MR. COLE: That is back on cutting. That is another of Lyman's terms. Apparently, he picked it up around Cudahy or somewhere. I think you all know what we are talking about.

MR. MACKINTOSH: There is only one thing it can be, it seems to me.

MR. COLE: I think you will all admit that it is much easier to demonstrate and do these things than it is to try to write them down on paper.

On these measurements, if you have no questions we will move right along because time is getting away from us.

MR. HANKINS: Mr. Chairman, the thickness of back fat in No. 2, "three measurements, including skin." I object to the inclusion of the skin. Skin is not fat. I think I am correct in saying that from studies that have been made, and we are studying the relation between thickness and back fat and the over-all fatness of the hog and the skin has not been included. At least that is true in our work at Beltsville. I fully appreciate the fact that I am disagreeing with another unit of the Department of Agriculture on this. I am sorry, but being honest with myself I feel I must. So I object to the inclusion of the skin.

And I should like to point out also that in studies made some time ago we found that the measurement of the back fat at the seventh thoracic vertebra came nearest to being the same as that of the average of all. That was when we took five different measurements and correlated each one with the average and the measurement at the seventh thoracic was most nearly like the average. So I would raise the question there whether we are missing something by omitting the measurement at the seventh thoracic vertebra.

MR. COLE: Do you want to incorporate in there that it be substituted for the three measurements or --

MR. HANKINS: No, I would not go that far, but I think the seventh thoracic vertebra measurement of the back should be in.

MR. COLE: We should point out that it is a good measurement if a single measurement is to be taken.

MR. HANKINS: And on that ground you would not seem likely to throw it out when you are taking several.

MR. COLE: As to this matter of skin. Of course, you all know why it is in there. The committee was in agreement that was the way it should be. Of course, the United States Department of Agriculture's standard is based with the measurement of the skin included, and we are recommending that we use these tentative grades. I think personally that even though they have their faults they are really something good to shoot at. They are something we can refer to. We all know what we are talking about. It is here, a standard, so we think that it should be

MR. HANKINS: It depends entirely on what your objective is. If you merely wanted to predict a grade from the measurement of the thickness of the back fat I don't suppose I would argue with you too much. If you want to know how fat the hog is that is something else.

MR. COLE: My next question would be how much difference is there in skin thickness? Do we have anything to show that there is a significant difference?

MR. HANKINS: I cannot show you any figures but from observation we know there is considerable variation.

MR. RUST: I think that the inclusion of skin in these fat measurements just introduces one more variable, and I personally think from the measurements we made we excluded the thickness of the skin, and also in these carcass studies that we made we included the fat back thickness at the seventh thoracic vertebra, giving us a total of four measurements to use in our work.

I should like to place it in the form of a motion that we amend this recommendation to exclude the skin in the thickness of the fat back measurements and to include the thickness of the fat back measurement at the seventh thoracic vertebra.

MR. COLE: Do you want it included as an optional on the seventh thoracic? In other words, if you take 4 you should take 5.

MR. RUST: Well, I think, in line with this work that has been done where they have found it closely equals the average of the three, it is probably just as well to include it.

MR. COLE: All right, there is a motion before the house that we delete the words "including skin" and add "seventh thoracic vertebra."

MR. MACKINTOSH: I think it would be well just to change that "including" to "excluding," so there will be no question in anyone's mind.

MR. COLE: Excluding skin.

MR. KEMP: If these measurements are primarily set up to conform with these tentative standards, which I think they are, unless the United States Department of Agriculture is going to exclude skin, I don't think we should. If they change the wording of the grades to exclude skin, we should, but if we are setting up standards we had better go along with them.

MR. HANKINS: That is the reason I said it depends on what your objective is.

MR. COLE: I think they will tell you that you can add one-tenth of an inch and come out very close to the objectives of the grading laws.

MR. ZIEGLER: The skin runs about 2 millimeters.

MR. OLIVER: Where do you draw the line between the skin and the fat of the hog?

MR. COLE: Do we have any discussion about the motion that is before the house? All right, let's call for the question. Those in favor of changing the second portion to read "excluding skin and including the seventh thoracic vertebra" let it be known by raising your right hand; those opposed. We have 17; against 16.

MR. BRADY: I think your motion should be stated so as to include what this measurement is going to be used for, and if the measurement is going to be used for carcass grades include the skin. If it is to be used for something else, it will be out. I think that would probably satisfy everybody.

MR. COLE: Do you want to amend the motion to that effect?

MR. BRADY: I would prefer that whoever made the original motion do it.

MR. COLE: I don't believe that motion ever got a second, by the way.

MR. ADAMS: No, it did not. I did not vote on it either.

MR. COLE: So I suppose we can include it in the motion and vote over on it.

MR. BRADY: In other words, you can see that you might have both measurements, if you were doing a detailed study, for example.

MR. HINER: Isn't the variation within the grade on the average thickness enough to allow for the tenth of an inch addition?

MR. COLE: No, it isn't. A tenth of an inch will throw it down or up a grade very easily.

MR. WANDERSTOCK: You are introducing a loophole which will enable us to use either method and some times we are not going to worry about what the purpose actually is. I think to have it one way or the other is better than average.

MR. HANKINS: Mr. Chairman, I agree with Dan Brady's suggestion. I would like to second the motion. But I would like to suggest that we specify that where the primary objective is the estimation of the over-all fatness of the pig, back fat measurements, excluding skin, be taken.

MR. COLE: All right, let's vote on a motion of that kind.

MR. KUNKLE: A question before you vote, please. We would like to ask, are these standards tentative or have they been accepted as of last spring?

MR. ZIEGLER: They have not been accepted. They are being used.

MR. MACKINTOSH: There is another little question that comes up. We now have a method by means of which one can measure the depth of the back fat on the live hog very simply, and I understand it is being done in a good many cases where hogs are later being slaughtered. Of course, they are including thickness of the skin there, but I think if you want it you have to make both of them.

MR. COLE: We make reference to that in pork later on. That reference is cited in the recent issue of the Journal, for instance.

MR. FRANCIONI: I would like to raise a question. Are we going to use millimeters in beef and inches in pork?

MR. COLE: According to the conference we voted on millimeters in all respects. If it is in here in tenths of inches it is an error.

The motion is that in those cases where research is aimed at determining the fatness of the pig we should exclude skin and if our research is geared toward grade standards we should include skin. Is that the way you want it?

MR. BRADY: That is essentially correct. But I think the purpose of what the research is intended for should be clearly stated.

MR. COLE: Do you understand the motion well enough to vote on it? All right, those in favor let it be known by raising their right hands; those opposed. It looks like that is passed.

MR. HANKINS: What about the other point?

MR. COLE: The seventh thoracic vertebra. Do we want to have a motion that it be included?

MR. MACKINTOSH: I so move that we include the measurement of fat back at the seventh thoracic vertebra.

MR. COLE: Is that going to be in addition or optional?

MR. MACKINTOSH: I would recommend that in making measurements on experimental hogs, it be made anyway. It is a simple matter to make that measurement.

MR. FRANCIONI: I hate to be bobbing up but I don't like this word "optional" if we are going to unify our work.

MR. COLE: The only question I would raise is when you figure average thickness of the fat back does it figure in?

MR. MACKINTOSH: Absolutely.

MR. COLE: If that is clear, there is a motion and do I hear a second?

MR. DEANS: Second

MR. COLE: Any discussion?

MR. HANKINS: May I suggest that all four measurements be taken, the three that you have specified plus the additional one of the seventh thoracic vertebra, and then naturally you would average those four.

MR. COLE: All right. Time is running out here. Is there any further discussion? All those in favor of the motion as explained and made let it be known by raising the right hand; opposed. (Carried)

I do think that part of your report, concerning monetary value or price summary, might merit some comments from you. I got this sheet from Lyman Bratzler, and I believe North Carolina had some work especially on this price index. I think we are faced with the necessity occasionally of putting a monetary value on a hog in terms of evaluation, and this is an attempt to put down some prices that could be used, standard prices.

What is your comment concerning this? Brown, of North Carolina, you worked on this. What is your comment?

MR. BROWN: The purpose was to do the breeding and, second, to develop a simpler index. The index in use at the present time or that had been in use up to the time of the work on this index is one that was proposed by Dr. Dickenson along the same line and modified to fit the conditions of our laboratory. It was, I might say, rather cumbersome. It was hard to handle. It required a number of measurements -- about 31 measurements -- and some weights before you could arrive at an index value. An index now of carcass values allows unusually high merit in one portion or cut to make up for deficiencies in one of the other cuts. So after we used this modified index to determine the differences due to breeding we set out to find a little simpler method of evaluating these carcasses with a fewer number of weights and measurements. We determined simple correlations to decide which measurements were correlated closely with the modified Dickenson index, and assumed it to be the correct estimate of the carcass value.

There are two things that our study brings out. One is that the area of the eye muscle is pretty important. It was correlated about .8 with the modified index value. Also the percentage of lean cuts were very highly correlated with this modified Dickenson index value. It was very hard to decide how much weight there should be per square inch increase in area of loin muscle. So we decided to use the primal cuts, these three cuts that you see listed on your sheets, and to use them as an index and compare this index with the modified Dickenson index and another index that we had at North Carolina. This short index compared very favorably with the other indices. We ran breeding groups according to average and found that the breeding groups remained practically the same whether we used this short index or whether we used the longer index that required more measurements.

This index, as you will see on your sheet, makes use of relative prices, and the relative price of loin was taken as loin equivalent 1, and the ham and shoulder were rated according to this. For quick check on the carcass you can add the weight of the ham and the weight of the loin and take three-quarters of the weight of the shoulder and come out with a pretty good estimate of the index value of that carcass.

MR. COLE: Unless you have further comments, we are going to call it quits.

CHAIRMAN BRAY: Thank you, Professor Cole. It is five minutes to one. Let's be back here five minutes to two, ready to go.

(The meeting adjourned at 12:55 o'clock.

# # #

WEDNESDAY AFTERNOON SESSION

JUNE 11, 1952

The meeting convened at 2:10 o'clock, Chairman Bray presiding.

CHAIRMAN BRAY: Let's take our seats and start on the remaining portion of our program.

(Announcement.)

CHAIRMAN BRAY: On our program this afternoon is the report of the Research Methods Committee. Last year a number of methods were brought forward that were being used in our research work in this country. So I am now going to turn this program over to Mr. O. G. Hankins, Chairman of that committee.

RESEARCH METHODS COMMITTEE

1. O. G. Hankins, Chairman
   B.A.I., U.S.D.A., Beltsville, Maryland
2. D. E. Brady, University of Missouri, Columbia, Missouri
3. R. W. Bray, University of Wisconsin, Madison, Wisconsin
4. F. E. Deatherage, Ohio State University, Columbus, Ohio
5. J. L. Hall, Kansas State College, Manhattan, Kansas
6. Joseph Kastelic, Iowa State College, Ames, Iowa
7. V. K. Johnson, West Virginia University, Morgantown, West Virginia
8. Albert M. Pearson, University of Florida, Gainesville, Florida
9. W. L. Sulzbacher, B.A.I., U.S.D.A., Beltsville, Maryland

MR. HANKINS: Thank you, Dr. Bray

Gentlemen, it is unnecessary for me to point out to you that we are getting started late here this afternoon and that could mean a late finish.

We are going to present this report to you in five installments. Four of those will make you think of last year's report when we divided up the subject matter into physical, chemical, microbiological, and organoleptic methods. We shall do it the same way this time. However, in addition to that, we thought that we should have some new feature, and it was suggested that we bring in statistical methods for consideration. So we looked around to find a suitable speaker on that subject, and we were fortunate in obtaining the consent of Dr. Ralph Schott of our organization, that is, of the Animal Husbandry Division of the Bureau at Beltsville, to talk to you on statistical methods or statistical design, statistical planning, if you will, in meat research. So first I am going to present Dr. Ralph Schott.

DR. SCHOTT: Well, it is quite a new thing for me to appear here, never having been at your meetings before, but having listened to developments and discussions, I feel quite at home in all the phases and all the approaches to experimental work discussed, how to do it, etc.

To get to what we have to offer this afternoon, I have sketched out a few ideas here rather simply, that is, I should like to take a rather simple attitude toward experimental design and how it fits into our thinking. It did not seem in order, with the request that came to me, to fix up an elaborate system of designs, etc. for this presentation. You have those in your textbooks. I am just going to read a few paragraphs that we have jotted down.

# # #

EXPERIMENTAL DESIGNS

Pertaining to Meat Projects

RALPH G. SCHOTT
UNITED STATES DEPARTMENT OF AGRICULTURE

Finding ourselves interested in experimental studies in Meat, we are surrounded with the push of practical and economic questions, and the framework of pure and applied scientific methods. An informal discussion of some of the practical approaches to experimental situations seems more in order here than a vest-pocket edition of pure science in the form of mathematical methods.

Taking a familiar picture of each of us digging away in his favorite salt-mine, over the shoulder comes the question, "Is it statistically significant?" If you have ever found yourself in this frame, then you will appreciate a glimpse of Professor George Snedecor laboring faithfully with a group of biologists. In summary he says, "If the mechanics of statistics bewilder you, then use common sense." He, however, did not stop at that, for he must have been convinced that common sense was very highly correlated with the mechanical expressions of values arrived at through arithmetic.

What are the basic concepts that are common to research in general and meat projects in particular? We find that there are three basic elements in every-day thinking that are interesting in review. Stated briefly, there are three units of thoughts plus 10 times some nearly infinite number of mechanical gymnastics that gives us what we call a science. Let's first examine the three thoughts treated as fields or units of activity, and leave the nearly infinite number of mechanical operations for occasional reference.

Our first common and general experience is a process of sampling. To start with, we likely had a taste of warm milk. We retained it and took a nap, or rejected it and became a problem child. In any case, every phase of living is a pattern of sampling. Since we are in only one place at any given time, we accumulate a store of sampling experience by remembering situations pictorially or by recording items in simple arabic numerals. Eventually the store of samples becomes large enough so that the items are arranged into patterns and groups, and we show some behavior guided by experience and imagination. Sooner or later we are able to thwart the animal kingdom by an occasional thought.

Taking a sample from our favorite salt mine, it is similar to previous samples in some respects, taste, structure, etc., differing in size, weight, and color streaking. These items are recorded in our store of numbers. With every turn we experience variation of some sort. In groups of samples we strike averages, and grouping implies something definite in the range of variation. A basis for classification then becomes the mean or average, and we find ourselves estimating the range within which the true value or most likely value lies. Estimation then becomes a definite statement of the limits of variation and the probability of their correctness.

The second field of every-day activity is really a section in the use of our sampling processes, that is, making use of samples to observe similarities. In reviewing some of the literature on correlation, we agree that it is an ocean added to the field. Nevertheless, our use of the process of comparing the similarities in things is as unavoidable as breathing.

The third field of activity is the converse of the second. This is a study of our samples to note differences. This item differs from that one. This group of items has a different average from that. The variability of this group is not the same as in the other. We look for markers, boundaries, and guide posts to describe these naturally encountered situations. There is a mountain of literature adjacent to this field. We may look for assistance in multiple mean difference analyses in latin squares and weighted averages and indices, but our feet are kept on the ground by first-hand experience and observation of the material with which we work.

The problem or objective of a piece of work may be formed out of our own storehouse of experiences. Or popular demand for information on a practical situation may have grown to such weight that administrative directives add cash to the pursuit. That still leaves the responsibility of putting the problem into working form. Our question here is how to get the elegant machinery of statistics to help us without bewildering the statistician with the biology. Here we would like to paraphrase, if not quote, from one experienced designer. It is a good practice to make a written draft of a proposed experiment. This will have three parts: A statement of the objective; a description of the experiment, telling about the experimental treatments and ending with an outline of the proposed method of analysis. The all too common faults of projects are their vagueness and excessive number of objectives. The vagueness disappears when the material to be used is thoroughly described along with the techniques to be used in processing it and the objectives reduced to one clear problem statement, or at least to one major objective and several minor supporting objectives.

Time spent in planning is never time wasted. When we have stated the objective, selected the variables to be measured, the treatments to be used, pointed out the laboratory difficulties, specified how much work can be done in a day, and what kind of instruments are to be used, then the statistician can give suggestions as to how the design will function in providing answers through the numerical data.

For bringing to mind some of the questions in the formation of a project, let us outline a few features of a given problem:

Study four methods of curing hams with reference to storage.

This indicates the objective.

The material is right and left hams from some required number of pigs.

The methods available for testing are physical, chemical, microbiological and organoleptic.

Pigs 1-12 R = right ham L = left ham

Plan:

Treatments	A	B	C	D
	R_1	L_1		
	R_2		L_2	
	R_3			L_3
	L_4	R_4		
	L_5		R_5	
	L_6			R_6
		R_7	L_7	
		R_8		L_8
		L_9	R_9	
		L_{10}		R_{10}
			R_{11}	L_{11}
			L_{12}	R_{12}

This gives an incomplete block design, balanced for the main tests at one period. In general, at least one replication of each basic observation is desirable.

This design should answer the question of right and left differences, and treatment effects without replication.

Assume one method and one item for each ham for analysis.

	Degrees of freedom	
Between Treatments	3	
Between Right vs. Left	1	Tests for significance
Between Treatments (R. vs. L.)	3	
Within Error Interaction	16	
Total	23	

Repeat for each method.

Since the main block layout is balanced, that is equal numbers in the main classifications, replication can be achieved within the blocks.

Provision must be made for six-months, nine-months, and twelve-months tests.

We have coming up on this program several discussions of the working parts of projects. This will allow us to discuss applied techniques and here pass to the concept of statistical significiance. After the mill work of calculation is done, we find no-star, one-star, and two-star values, non-significant, significant, or highly significant. These are only mechanical landmarks indicating the range and relationships of variability and the reliability of estimates, etc. Before releasing your statistician from cooperative bondage, ask him to explain the meaning of each end result and its earmarks. We feel sure that he will go back with you to the fields of common sense and weight each conclusion in terms of useful and constructive information.

In summary, our every-day ways of thinking have always and must always provide the structure on which numerical work may be done. Mathematical methods are useful in describing and summarizing the information that we have stored in our recorded numbers. But progress and satisfaction in experimental work will always be led by exploritory thinking, inquiry, and imagination in planning.

Literature Cited

1. Facts from Figures. M. J. Moroney. 1951. Penguin Books, Ltd.

2. Agricultural Information Bulletin No. 34. U.S.D.A. 1951. Sensory Methods for Measuring Differences in Food Quality. BHNHE, ARA

3. Snedecor, George W. Statistical Methods, Ed. 3, 1940.

- - - - - -

DR. HANKINS: Thank you, Dr. Schott.

Now, I am going to ask Dan Brady to present his report on physical methods.

# # #

PHYSICAL RESEARCH METHODS

D. E. BRADY
UNIVERSITY OF MISSOURI

Just a year ago Dr. Bray made a report based on the summarization of 47 questionnaires answered by college meat divisions, related departments, the United States Department of Agriculture, as well as the research divisions of certain commercial organizations in the meat industry. These questionnaires have been reviewed with a view to pointing up the opinions of the respondents with regard to the adequacies and inadequacies of the various physical methods being used in the various laboratories. I feel sure that you appreciate that the physical methodology of meats encompasses an area quite beyond the experience and knowledge of most individuals, groups, or even several groups of workers. Where the answers in the questionnaires indicated further information of value could be secured we corresponded with the workers in these laboratories and we have received a great deal of useful information from them. Their prompt response has been most helpful and is most appreciated. Since most of the information and interest was concerned with color, the greatest amount of emphasis has been placed on this field.

One of the problems that all workers have had some difficulty with is in securing an adequate number of representative samples. The greatest difficulty apparently results from attempting to secure a representatives muscle or cut of adequate size. The variability within a certain muscle is also a matter of concern. One research worker, for example, reports that differences are obtained in the lean-fat composition when slices are cut 1/2 inch in thickness when compared to those cut 1-1/2 inches in thickness. Concern is expressed as to the tediousness of making physical separations into the component parts, also with regard to grinding, taking alequot samples, and the changes which may occur during this handling.

In many cases answers to these problems in themselves create new problems which in turn may cause the research worker to become rather disheartened. This is especially true if the answer involves the need for extra facilities, more help, or additional samples. The additional cost of doing all of the physical testing in a room of constant temperature and humidity when even a room may be difficult to secure serves to illustrate the point in mind. Theoretically these limiting factors should receive attention in deciding the feasibility of the experiment. Practically, however, there are many limitations to such arbitrary decisions since deficiencies and their magnitude may become obvious only during the course of the experiment.

Many helpful suggestions have been made. For example, in securing uniform alequot samples the use of homogenizers, blendors and thorough grinding should be considered. The grinding of frozen samples at low temperature is a technique that may be most helpful for many types of determinations. This is also true of the power saw and slicer. The following of carefully thought-out procedures will generally more than compensate for most any amount of skillful improvising "on the spot," although good judgment in making decisions on unforeseen events still is a quality of considerable merit.

As previously indicated the problem that has concerned most researchers has been the manner and method of sampling. Often some cut or muscle is selected which is considered to be representative of the carcass for one or more of the characteristics which one may desire to measure. The physical composition of the 9-11 rib section has been found to be representative of the physical composition of the beef carcass as a whole. Likewise, similar sampling techniques have been developed for lamb. The relationship of back fat thickness and specific gravity measurements to one another and to the percentage of the lean and fat cuts has also been reported in the literature. More recently in a paper, Aunan and Winters report that through the use of a coring device it is possible to procure samples of fat and lean in the carcass. The "5-6 rib" sample core, these workers report, offers the best index of the lean tissue of carcass. A high degree of association was also found between the lean content of the samples and the percentage of the five primal cuts. The core samples were not as useful, however, in estimating the fat content as the back fat thickness. The ratio of fat to lean tissue of the core was highly associated with the ratio of fat to lean tissue in the carcass.

It is my understanding that specific gravity measurements on the cores from 1000 carcasses are now being made. This is an example of the type of research which is most useful in finding the answer to problems in physical measurements.

Another example may be found in the work at the Michigan Station. In answering the survey questions last year these workers indicated that they found the planimeter readings of the last rib of the pork carcass to give a good correlation with the cut-out value and that the loin plus the fat back was correlated with the cut-out value. I believe that you will be interested in their findings. I quote from Lyman Bratzler's letter:

> "In regard to the work that we have done on the last rib section of rough loins using the planimeter to determine the percentage of lean and fat areas in this cross section cut, we have obtained the following correlation coefficients:
>
> carcass cut-out - r = +0.855 with a SE of 0.060
> live cut-out correlation - r = +0.819 with a SE of 0.074
>
> In determining the total area we draw a line through the longest axis of the eye muscle to which a perpendicular line is erected and the enclosed area is used as the total area of the cross section. This eliminates any difference due to the manner in which the rough loin is separated from the rough belly . . ."
>
> "In regard to the correlation of the loin-fat back weight with carcass cut-out, on 478 hogs we had a r value of +0.820 with a standard error of 0.015 between carcass cut-out and back fat-loin weight ratio. Using the same ratios compared with live weight cut-out we obtained an r value of +0.561. These correlations compare quite favorably with those obtained by the Regional group under N.C.M.3."

A number of problems have been expressed by workers in regard to physical separation and weighing of samples. These include the variations due to different operators reading the scales, the difficulties and laboriousness in making the physical separations and the loss or gain in moisture of the samples to be analyzed. Most of these problems can be satisfactorily answered. They include weighing the meat in a room where the temperature is similar to that of the meat, keeping physical separation work to a minimum, systematizing of operations, speed, and as Professor Sleeter Bull points out, patience and fortitude.

In reviewing the questions on color one cannot but come to the conclusion that the present situation is not entirely satisfactory. Apparently there have been no new major developments in this field other than relatively minor technological improvements in the spectrophotometers with regard to adapters, but basically the picture remains unchanged. In general, if a full description of the color is desired, the work is a time-consuming, laborious process, both in taking the readings and in the subsequent calculations. The photoelectric cell has been found suitable for studying color changes such as darkening which takes place in the oxidation of muscle pigments. Dr. Betty Watts reports that she has used a photoelectric colorimeter successfully in following the oxidation of hemoglobin solutions and clear muscle extracts. Difficulty has been reported by some workers in securing satisfactory operation of photoelectric equipment in the cooler.

At the Missouri Station, H. D. Naumann with the advice and guidance of Dr. E. E. Pickett has been using the Cary Recording Spectrophotometer to secure the tristimulus values. He advises me that the recording spectrophotometer should prove to be one of the more reliable and useful instruments for the measurement of meat color. Some of its more important attributes are the absolute method of calibration, automatic recording of the absorption or reflectance values, and the rather complete characterization that can be made of the color of the sample. In line with this it is worth mentioning that both the visible and ultra-violet spectra may be scanned.

The color of fat may be determined on either solid or rendered fat quite satisfactorily. The determinations on lean tissue, however are very exacting insofar as the lapse of time between cutting the sample and making the determination. This, it should be pointed out, is not peculiar to this machine but is common to all methods.

The most serious criticism of this instrument is the area of the sample that is scanned. Solid samples, fat and lean tissue, are analyzed on the reflectance attachment which scans an approximate one-half centimeter area. This makes it difficult to be sure of obtaining a representative reading due to the influence of individual particles of fat.

In addition to the spectrophotometer, the Munsell disc system enjoys a rather satisfactory reputation. The workers at Michigan have been kind enough to list what they considered to be the advantages and disadvantages of this method.

Advantages

1. The readings are convertible to the universal color notation of hue, value and chroma.

2. The system has wide application in grading of various products.

3. It allows for an examination of a wide range in color without use of any one or more standards for comparison.

Disadvantages

1. The necessity of selecting the proper disc.

2. The element of human error in determining the correct proportion of each disc to be exposed.

3. The necessity for training and experience to secure rapid determinations.

4. The rather tedious task calculating the readings into hue, value and chroma notations.

Some of you may recall that the Lovibond Tintometer has been used in color comparison. Dr. S. R. Cecil, Associate Food Technologist at the Georgia Agricultural Experiment Station at Experiment, Georgia, advises me that they have used this method of color comparison in pork hams and shoulders during curing and storage. This instrument allows direct matching of colors of solid materials against standard tinted glass slides. Component colors as well as total color intensity are obtained with each comparison. They read the color in units of red, yellow and blue and indicate that they secure accurate quantitative estimate of changes occurring in cured meat. The chief limitation is that of any visual comparator in seeking agreement on the matching of color. As has been pointed out in the case of the Munsell discs, experience is required in making the proper combination of slides rapidly. A single trained operator can, however, secure a very reproducible set of readings.

One of the color standards that workers at Wilson and Company make reference to is Container Corporation Color Standards. They point out that while these do not exactly match the meat colors in which they are interested, they are the most promising ones they have used. They are washable and have a glossy surface on one side, thus making it easier for them to compare with the glossy specimens. They also make reference to the rather extensive literature in this field and especially the publications of the National Bureau of Standards and the U. S. Department of Agriculture as well as the test panel work of the paint and varnish industry. All of this work indicates the difficulty of reducing to a simple written record the change in color of even a uniform surface, let alone one which varies in color, gloss, and texture within the small areas selected for the test.

Dr. A. M. Gaddis of the Bureau of Animal Industry has written me with regard to the Bausch and Lomb Color Comparator which has been used at Beltsville. He mentions that this method is fairly rapid but that it also involves the human element and that it does not give results which are as potentially reproducible as is possible with the photoelectric cells. Dr. Gaddis makes reference to the following photoelectric instruments.

1. The Beckman Model D. U. with a reflectance unit-measurements are rather slow and tedious to make, and reflectance values may not always be duplicated.

2. The Hunter Color Difference Meter. This instrument has been used at Cornell and Rutgers with apparently quite satisfactory results from the standpoint of giving rapid and reproducible results.

Dr. C. Olin Ball of the Department of Food Technology at Rutgers University states:

> "We have used this meter now for almost three years in our project on prepackaged meat as well as in other applications . . . We have been well satisfied with the results obtained from this meter.
>
> "Practically all of our work has been in a measurement of reflectance although the meter is adapted to transmission measurements also.
>
> "We have found that the Hunter color evaluations (which are expressed in numerical terms) are dependable and reproducible. Small differences in color are readily detected and comparisons may be made advantageously either in terms of one component alone or in terms of a combination of two or more components. The three components, a, b, and L, enter into the measurements.
>
> "The limitations of the Hunter system seem to be similar to those of other systems in some respects. The principal limitation we have found is a temporary one and springs from the fact that a calibration of the numerical indications of the meter has not yet been made in terms of word descriptions of color. There is available, however, a conversion chart showing a relationship between Hunter components and Munsell components. Since a calibration of Munsell components in terms of word descriptions is available, this can be used in connection with the Hunter system after conversion of components has been made.
>
> "One rather unimportant limitation is the necessity to permit the instrument to come to temperature equilibrium before use. This requires about one-half hour."

A tristimulus photometer which is considered to be an improvement over the Hunter instrument has been reported by the Radio Corporation of America laboratories. Also reported in the literature is a photronic color intensity meter for measuring discoloration in meat by the Engineering Experiment Station of the University of Kentucky.

The majority of the workers report difficulties with color measurement. This is apparently a general condition which is not limited to the field of meat color research. Principal problems are: (1) Fat and connective tissue in the sample. (2) The changes resulting from the effects of time, temperature and humidity and light on the samples. (3) The necessity of securing a smooth flat surface without air pockets for some of the measurements. (4) The necessity of standardizing the instruments. These all present problems with which most workers are familiar. The fact still remains that because of the importance of color in meats there will always be the hope that some instrument will be developed which may enable the worker to record quickly and simply the color characteristics of meat.

There appears to be good general agreement on the usefulness of the Warner-Bratzler Shear although most workers do not rely upon it exclusively. One worker, however, thought the Shear was of no particular use; another preferred to use the panel method while another school of thought was that it was satisfactory in principle but rather temperamental. Apparently only about half of the laboratories have a Warner-Bratzler Shear.

- - - - - -

A few laboratories have used the penetrometer for determining tenderness on such items as skinless weiners and tripe. Another laboratory has used it to measure the force required to separate muscle fibers in the meat. Apparently it has little general usefulness in determining tenderness of meat, and its best application is in determining the firmness of fatty tissues and shortenings.

A number of the laboratories are making press fluid determinations. The method most generally used is that reported by workers in the Bureau of Animal Industry. Two stations use the Minnesota pressometer which utilizes a total pressure of 250 pounds or 200 p.s.i. All of the other laboratories report using the Carver press with a total pressure ranging from 9,800 to 16,000 pounds or total pressure of from approximately 2,500 p.s.i. to 4,000 p.s.i.

Specific gravity measurements are being used at a number of laboratories. In most cases the specific gravity measurements are of cores, cuts, or whole carcasses. Specific gravity measurements are used in indicating the composition of the carcass, in relating the composition of the whole animal to its component parts, and in estimating the percent of body fat and water in the carcass.

The refractometer is used by several laboratories as a measure of the firmness of fat, for soluble solids in press fluids, and as indication of purity in oils, fats and certain flavor compounds.

No great amount of histological work is now being carried on. This can be attributed partly to the fact that if facilities are available they are generally in a different department. Most institutions are not planning new work, although many of the respondents indicated that studies were needed on the changes which may take place in the ripening, freezing, storage, and processing.

- - - - -

MR. HANKINS: Bob, will you please take over the discussion?

CHAIRMAN BRAY: Thank you, Mr. Hankins.

I think Dan very well covered the physical methods that are now in use in this field of meat research.

I was interested in the remarks made about the probing technics that have been developed recently. I think the one that Kline and his co-workers at Iowa have used is a definite step in trying to find a way to see what the animal is like before we treat it and before we slaughter it. With technics of this type we are able to follow through many of our feeding practices and see what effect they have upon the carcass. To me that is a wide open field and we have to know a lot more about what is going on in the live animal prior to the time we slaughter it.

We have recently tried a couple of other technics at Wisconsin. I do not know how they are going to pan out. We hope that we can report on the results of them at a later date. The two methods that we are using involve biopsies prior to treatment of the animal. We have used it on beef where we have taken samples out of the semimenbranosus muscle and then fed the animal for 90 days or 70 days and then slaughtered it and used the muscle from the other side for comparison.

We are now in the process of doing it in hogs in which we are taking a biopsy from the longissimus dorsi muscle. We have taken several different weights. They ran around 50, 60 or 120 pounds, something of that nature. From these samples we have been able to make muscle studies and we do not run up against any infection problems. That is the first question that always comes up. We have no problems there whatsoever. So I hope that these probing technics are a step in assisting us in looking at live animals, using our treatment on the live animal, and then seeing what affect that treatment has had on the carcass.

I was also interested in the probing technic that has been developed at Minnesota. As Dr. Brady indicated, it probably isn't any better than estimating the lean-fat ratio or than that of the fat back thickness, but I am sure Dr. Aunan did not know that when he started out and I think we should credit men with trying to find better technics than those that already exist. The fat back thickness certainly isn't the last word, or at least we are not going to assume that it is the last word, in estimating lean-fat ratios.

Then this problem of color which Dr. Brady so adequately covered is a real one. We all know there are many factors that influence the color readings that we are going to get. One of them, of course, is the human factor that he mentioned, and I don't know that we will overcome that with some of the equipment that we now have available. However, the Hunter Color Difference Meter is one instrument that we have just recently had a little experience with, not too much, but we will have some more I am sure before the summer is over. It is an instrument that is easy to operate. You get your results rather quickly. And it eliminates this human error problem to a considerable extent.

Those are the comments I wanted to make on Dr. Brady's paper. Now are there any questions from the floor that you would like to direct to him at this time?

MR. E. A. PIERCE: I would like to ask a question of Dan. He talked about grindings for preparing the samples for analysis. I would like to ask him what type of grinder he would recommend for preparing a homogeneous sample for chemical analysis when the large sample has been achieved from several different localities. In other words, what kind of a grinder did you use so that your sample is homogeneous and get it fine enough.

MR. BRADY: Naumann, you might tell what you are doing in grinding those samples.

MR. NAUMANN: We are taking samples of meat, shall we say the ribeye, and grinding them. First, we are cutting up large enough samples to go into a hand-cranked job, grinding that sample initially, putting it in a large enough container so that it can be shaken rather severely, and then drawing from that aliquot sample, shall we say, and regrinding that about four or five times under prefrozen conditions. We feel that grinding it in the freezer, there is a much more thorough job of breaking the meat down into small particles. You get away from the problem of having small pieces of connective tissue adhere to your knife blade or fail to go through. There is no statistical basis for it, but common observation would certainly credit the use of the method because it gives you a more adequate aliquot sample.

DR. HALL: What provision do you make to avoid separation of moisture when you freeze it? Do you freeze your chunks in a closed vessel?

MR. NAUMANN: Yes, sir, they are frozen actually. We are separating the constituents, lean and fat, weighing them, and packaging them in different packages in foil and freezing them. After they are frozen in these packages we then take them out and perform the grinding. We have no way of telling exactly how much moisture we lose.

MR. HALL: Isn't there some frost adhering to your foil when you open up the package?

MR. NAUMANN: Well, no sir, none that is observable. In other words, we make the sample fresh, unfrozen. We wrap it in foil, and we get the gross weight then of the foil plus the sample. When we bring it out to grind it, we weigh it again. If the sample weighs somewhere around 5 kilograms we might lose a gram. I think that is within the error of our weighing.

DR. HALL: Do you still weigh it in the foil?

MR. NAUMANN: Yes, sir. There is no visible frost adhering to the foil.

DR. HALL: That is the point I was interested in.

CHAIRMAN BRAY: I know that this discussion could go on, but in order not to infringe upon the time of the remaining speakers, I think we will call it to a close.

(The following paper was submitted to the conference but not read)

# # #

ADVENTURES IN TESTING MEAT FOR TENDERNESS

K. F. WARNER
EXTENSION MEAT SPECIALIST
B.A.I. -- USDA

This should have been written back in the twenties, when it happened. It should have been written in chapters with detailed supporting evidence. It wasn't. The hunt for an objective measure of the tenderness of meat followed a winding trail. Each failure suggested other possibilities, and the pursuit proved more intriguing than the recording of disappointments.

These experiences of my pre-extension days at Beltsville are recalled and recorded here in the hopes that some of them may provide an idea or stimulus to others. More people, better trained people, are now endeavoring to measure the qualities of meat. Perhaps, these facts will help them find a better way to measure tenderness than the present shear.

When the Purnell funds made meat research possible, in 1924, objective tests for quality were made the first order of business. Measuring flavor ran too deep into organic chemistry for me. Color measurements held only a casual interest for one (who is partially color blind.) Tenderness was one of the most important palatability factors. Besides I was equipped with good teeth to check results and measure progress.

Our first device to measure tenderness in meat was a smooth wire "saw." The blade of a hacksaw was replaced with a length of smooth, well-stretched piano wire and the saw mounted on a frame. A motor moved the saw back and forth across a sample of raw meat, cored with the grain by a one-inch cork borer. The number of strokes needed to cut through the various samples varied with the approximate tenderness differences among tenderloin, rib-eye, and round. We were encouraged.

Then we tried to cut samples of cooked, chilled meat. Even the weighted wire would not work. The wire wore a slight groove, then glazed or greased it over and slid across it hundreds of times without cutting much, if any, farther.

We did not try a roughened wire, figuring that a standard sharpness could not be described or maintained; neither did we try hot cooked samples or ones that had been cooked beyond the rare or medium F. stage.

The pressure from the palatability grading committee for an objective tenderness umpire increased. Without mentioning any names I had also a secret desire for a chance to prove A. T. Edinger wrong.

At the conclusion of a personal survey of material testing equipment at the Bureau of Standards and the Bureau of Public Roads, we made some corrugated "dogs" to hold a length of meat while we tested its tensile strength. Cutting long, uniform, comparable samples proved impossible. In addition our sets of corrugated teeth proved less than "dogs." The meat pulled loose from them. We added the dogs to the wire saw on the shelf.

A set of false teeth mounted on iron jaws took a recorded pressure, satisfactorily. The trouble was that the teeth squeezed, but did not break all the tissues. We considered trying a small grinder or macerator, but the problems of complete shearing and leverage, veered us off to other possibilities.

In the Bureau of Public Roads were devices used for measuring the compressibility of materials. One machine consisted of a long cylinder, 1 inch in diameter with a steel rod or piston that fitted snugly into the cylinder. At the opposite end of the cylinder dies could be inserted with holes of various sizes. A beam scale recorded, semi-automatically, the current force of the plunger as a motor forced it slowly into the cylinder and against the material being tested.

We used a die with a center hole about 30-thousands of an inch in diameter; placed a cored sample of raw meat 1 inch in diameter and some 2 inches long in the cylinder and started the motor.

The first spurt of meat came through the small opening in the die when the pressure reached about 400 pounds. From then on it was impossible to predict progress or pressures. Progress was a series of flows, stoppages, and spurts. Pressures ranged from 400 to over 4,000 pounds. Most of the flow was between 1,000 and 3,000 pounds. Pressures ran higher with the tougher meat, but the rapid variation in pressures required for a single sample seemed impossible to record as an average and use.

The detail of this tryout with the compression machine is recorded here because of two observations that intrigued me both then and now.

First, the whole end of a sample of raw meat cored with the grain "flowed" to and through the small, center hole in the die. The flow was not from the center or one side, but evenly across the whole sample. It was as though the center of the sample "caught" in the die and pulled the whole face of the sample with or just behind it. The end of the remaining portion of a meat sample resembled a full bag of grain with the neck of the bag tied tight.

Second, after being pressed through the die, the raw meat sample consisted of what appeared to be loose meat pulp and a connected network of pulpless connective tissue. It was as though you pulled a sapling through a picket fence separating it into a network of trunk, branches, and twigs, and a pile of loose leaves. The amount of expressed juice seemed small. The possibility of using this procedure to make a gross measure of the connective tissue; to use it as a first separation for chemical analysis or to study the reaction of collogen and elastin to this pressure separation seemed to offer possibilities. At that time, however, the Navy machine shop finished a new device for us and we never followed up those leads.

John Jones, the instrument maker for the BAI, had worked closely with me in mounting the wire saw and machining those faithless "dogs." He had also tried to rig a pair of tin snips so that it would shear off an end of meat. John had a friend in the Navy and with and through him, the Navy built (for a consideration) a special shear. It consisted of two hard steel plates 8 inches in diameter and 1/2 inch thick mounted above the other. A 1-inch hole was bored through the center of both plates and a solid steel rod just a few thousands smaller than the holes was made to slide through them. The remembrance of that expert workmanship still gives me a thrill. The absolutely square cut bottom of that polished rod was guided by the hole of the top plate so smoothly, and accurately that it slid into the bottom hole without a miss or click.

We cut a flat sample of raw meat along the grain, laid it between the steel plates over the bottom hole, guided the rod onto it through the hole in the upper plate and applied the pressure (how, is no matter now.) The load on the rod built up until, suddenly, the meat gave way. The rod and the section of sheared-out meat plunged through the hole in the bottom plate. The shear did not sink by fits and starts, as the compression cylinder had. It built up to a maximum and then gave way all at once. To give this device a good test we needed only to find some way to obtain a uniform flat meat sample. It proved easier to redesign the shear.

The carpenter at Beltsville built me an ordinary miter box, ordinary except that it was only some 8 inches long, narrow and sturdily made from hard wood. Jones, the instrument maker, cut a 1-inch square hole in a steel blade that is used for scrapping floors. The blade, we later found, was 42 thousandths of an inch thick.

I mounted the miter box on its side between 2 overhead beams that held the rail at the Beltsville meat laboratory; pushed the metal blade up through the slits in the box until the hole in the blade was inside the box; placed a 1-inch cored sample of raw meat through the hole; wired an empty wash tub to the lower end of the blade; put on my rubber boots and turned the hose into the wash tub. Again the load built up to a maximum and burst through all at once.

We had to lower the tub nearer the floor and pad the floor to prevent splashing. When that was done we weighed tubs of water that corresponded in comparative weights to the approximate toughness of the meat samples sheared.

Johnny Jones then mounted the miter box, bottom down, on one end of a 2 inch plank and a screw bolt and housing with a hand crank at the other. We hooked the shearing blade to the hand driven screw with a pair of spring ice scales in between and I took off my boots.

When the meat research men from the cooperating states visited our lab one summer, M. D. Helser, then in meat work at Ames, suggested that we replace the ice scales (read 'em before they snap back) with a dead hand dynamometer that records the maximum pull. I would have thought of that myself if I had known they made dead hand dynamometers. A steel miter box replaced the wooden one and we were ready to give the shear a real try out.

The right ribs from cattle in these early meat tests were analyzed physically and chemically. The 9-10-11 ribs from the left side were used in the cooking and palatability comparisons. This gave us a chance to shear samples from the raw, right 9-10-11 ribs and "predict" how the cooked left ribs would compare for tenderness. None of our shear test rankings of the raw right ribs checked with the tenderness grades of the cooked left ribs as recorded by the palatability committee.

Hopefully, though a bit desperately, we brought the cooked 11th rib from the cooked left roasts to Beltsville, and sheared the chilled samples, 3 samples cored from each rib eye and each sample sheared 2 or 3 times depending on the length of the samples from the hot rib. The correlation between committee grade and shear was close. We, who turned the hand screw on the shear and chewed the cut samples as a check, could even opine that the committee was not infallible.

Ram and wether lamb comparisons from cooperative tests in Maryland, Tennessee, New York and USDA put some 400 lamb carcasses through the Beltsville lab and through Miss Lucy Alexander's experimental kitchen. We sheared corresponding samples from the raw right leg and the cooked left leg. The shearing strength of the raw ram legs was consistently higher than that of the raw wether legs. The difference averaged about 7 pounds per shear.

When the left ram and wether legs were roasted the committee and the shear agreed quite closely on the tenderness of the individual legs. Neither, however, agreed with the individual shearing strength of the raw legs, and neither found any consistent difference between the tenderness of the cooked legs from the rams and wethers.

We theorized that the greater and different shearing strength of raw meat from the ram lambs was influenced by connective tissues (and possibly other things) that were changed and softened in cooking. We concluded that the tenderness of cooked meat could not be predicted by shearing comparable uncooked samples. It will be most useful if some investigator can prove us wrong.

O. G. Hankins and Paul E. Howe, who had encouraged our efforts and had laughed with the "rubber boot scientist" when the old wash tub hit the floor, now began to put the committee grades for tenderness and the shearing strength of the cooked meat into real summaries. They applied the statistical squeeze. They came up with correlations of .79 and .82. The graphs of the committee grade and the shear strength for cooked "green" right lamb legs were strikingly similar and reflected approximately the same differences when compared with those recording the tenderness of the cooked aged left legs.

Forty-eight pairs of lamb legs were used in a special test of both the palatability committee and the shear. Rights and lefts from the same lamb were cooked, graded and sheared on the same day. Similar committee grades and shear strengths for the similar right and left legs were recorded. Both committee and shear moved up and down pretty much together with the varying tenderness of the meat from individual lambs.

Mr. Hankins asked "If the shear principle is useful, what type of shear is most precise?" Mr. Bratzler answered that one.

Lyman J. Bratzler then a graduate student at Kansas State College in 1931, was working under Prof. D. L. Mackintosh. Mr. Hankins arranged a modest cooperator's stipend for Mr. Bratzler and he went to work to discover the thickness of blades, size, shape, and dullness of the hole in the blade, the position and speed that gave the most precise results.

With Shakespearian imagination Mr. Bratzler brewed a mixture of rubber (the old boots again), beeswax, rosin, and paraffin, that produced 1" "candles" with a uniform, repeatable shearing strength. Then in an air-conditioned room, he proceeded to discover the design that reproduced the shearing strength of these candles most precisely.

Mr. Bratzler went further. Knowing the most accurate design, he figured out the motor driven mounting easiest to use and induced the G-R Manufacturing Company at Manhattan to make the patterns and the Warner-Bratzler

The end of the objective testing of meat quality is not yet. Possibly these experiences will help others to add and to improve.

- - - - - -

MR. HANKINS: Are there any other comments or suggestions? If not, I believe it would be in order to adopt this report. Would someone be so kind as to make such a motion?

MR. WANDERSTOCK: I so move.

MR. KUNKLE: Second.

MR. HANKINS: It has been moved and seconded that we adopt this report submitted by Dr. Brady. Any discussion? All in favor will say "aye"; opposed. The motion is carried.

We shall now move on to the next section of our report which has to do with chemical methods. Dr. Pearson, will you kindly take over?

MR. PEARSON: Mr. Hankins and Fellow Workers: I should like first to make a plea for inclusion of the chemist in planning the stages of an experiment if you anticipate using him. I know that frequently most of us as workers in meats are called by the people in animal husbandry to undertake meat studies without having any particular part in the actual planning of the experiment and we are well aware of the difficulties that causes. I am sure if we make proper use of chemists in the planning, the laboratory technicians that we have working with us and our graduate students, we will find that they can contribute considerably in telling us what can be done and what methods are available. So I should like to make that plea in commencing this paper.

# # #

CHEMICAL METHODS-
THEIR USE IN MEATS RESEARCH

A. M. PEARSON
UNIVERSITY OF FLORIDA

Last year the chemical methods committee gave a brief summary of the results of the questionnaire. This year it is our purpose to point out some of the areas where improvement of available methods is needed. In developing this subject we shall follow the same general outline as previously used, making omissions where no comments are necessary or when adequate information is missing.

MUSCLE - ROUTINE ANALYSIS

Total N

The response to the questionnaire indicated that the Kjeldahl-Gunning-Arnold Method (AOAC) was the method most commonly used. This method requires from 1.0 to 3.5 grams of material, and thus, is satisfactory for most routine determinations. However, where only extremely limited amounts of material are available, the Micro-Kjeldahl Method would seem to be more useful.

NPN

Only a small number of researchers have been actively engaged in making NPN determinations. All methods used vary in some respects but apparently give very good results. It appears that more research could be undertaken in this field, particularly in determining the nature of changes occurring in aging and freezing.

Fat

Although fat determinations are commonly made on meat and meat products, there appears to be considerable diversity of opinion on the suitability of the methods being used. The modified Babcock procedure is being used with considerable success especially where the sample is weighed directly into a cheese bottle through a side opening, thereby avoiding the losses encountered in transferring from a beaker. Some of the advantages of the modified Babcock method are the speed of operation and the simplicity of the equipment required. Another method, which can be used on live animals but is not adapted to routine laboratory determinations, is the antipyrine dilution method. This method has been used by Mr. Hankins and his co-workers and I am sure that he can tell us some of the advantages and problems encountered in using it.

Moisture

Results of the questionnaire indicate great variations in time and temperatures used to determine moisture, though most of the methods consisted of oven drying. Although the variation may appear to indicate disagreement in this regard, on closer examination it seems likely that convenience in using ovens being utilized for other purposes and in making the time agree with a work schedule is more likely the cause of the variability. Although, no mention was made as to the use of CO_2 to prevent oxidation of the fat during the drying process, this modification of the usual oven drying procedure seems worthy of consideration, especially in working with tissues containing large percentages of fatty materials.

Another possibility of a rapid method of moisture determination for meat products is the toluene distillation method described in the AOAC for grain and stock feeds. This method is very rapid and reliable as only one weight must be taken. The amount of moisture distilled over is measured and simplifies the entire procedure. This method fits in well with the modified Babcock procedure of fat determination as aliquot samples can be used. However, when only limited amounts of tissue are available and it is necessary to obtain both fat and moisture on the sample, conventional methods may be more desirable.

MUSCLE - SPECIALIZED

ATP and ADP

Very little research is being done on ATP and ADP in meat. The manometric technique of Umbriet, Burris and Stauffer is apparently the best available method, but is time consuming and requires special equipment not available in most laboratories. Since ATP and ADP are the sources of energy in the live organism, it appears plausible that it may be intimately tied up with post-mortem changes and perhaps be associated with changes occurring during aging and freezing. A simpler method of analysis is needed in order to facilitate determinations of ATP and ADP and to explain their relationships in meats and meat products.

Press Fluid

A great variability of opinion exists relative to the value of this determination. In general, a lack of confidence in the reliability of press fluid measurements exists. Perhaps some of the dissatisfaction could be overcome by adapting a more definite procedure of operating the press and preparing the sample. Certainly if press fluid determinations fail to add any information of value to the literature, they should be discontinued, or if of value, they should be worked out so as to give repeatability in the results.

Collagen

Recently there has been a marked revival of interest in collagen. The interest in collagen is justified since the amount present in tissues is closely associated with tenderness. There are several methods of making this determination and constant efforts are being expended in bringing about improvements in the procedures. The two methods showing the most promise are the method of Wang of the American Meat Institute and the method of Hartley and Hall of the Kansas Station. The method developed by Dr. Wang makes use of the specificity of collagen for certain stains and measures collagen by determining the intensity of light passed through a microscopic section of stained tissue. The advantage of this method is it also gives a more accurate idea as to the distribution of the collagen within the tissues being studied.

The method of Hartley and Hall is being more generally used than the other method. This procedure makes use of the centrifuge and Waring Blendor to separate the collagen from the other meat proteins. Although this method does not give a distribution pattern for collagen, it is highly repeatable for fresh meats and shows considerable promise.

pH

Measurement of pH in meat may appear to be a simple chemical determination, yet there is considerable variation in the methods used. One of the most common methods of preparing the tissues for pH measurements is by making a distilled H_2O and tissue slurry. Preparation in this manner, of course, may result in some change in pH due to taking up of CO_2 from the air. However, such a change would normally be slight during the time required for a pH determination. The advantage of this method is the homogeneity of the sample. The actual measurement of pH is usually by the glass electrode method.

SH Groups

Very little work is being done on the determination of SH groups. Since SH groups indicate the breakdown of proteinaceous material a good method for determination in meat products appears to be desirable. A reliable method could be used to follow the changes occurring in meats during aging and processing.

VITAMINS

Vitamin A and Carotene

Satisfactory methods are available for both vitamin A and its precursor, carotene. In general, these methods are not widely used since vitamin A and carotene occur only in limited amounts in meat, being primarily localized in the liver and to a lesser extent in the fatty tissues of animals on green feed. However, further studies are needed to ascertain the stability while in the cooler, or for liver, after being cut and placed in the showcase.

Tocopherols

A good method of determining tocopherols is needed, especially since this vitamin group is closely allied with improvement in the keeping qualities of animal fats. However, it is doubtful whether this method would be of as great importance to the meats industry as in making possible more detailed studies in animal nutrition.

B-Complex Vitamins

The B-complex vitamins are difficult to discuss under so simple a classification but time is too short to delve into each one individually. Most members of the vitamin B-complex are assayed microbiologically but the test organism and make-up of the basal medium varies with individual vitamin being determined. In this type assay the growth response of the organism to a given amount of the tissue is plotted against the response to a known amount of the vitamin. The actual method of determining the growth of the organism can be by titrating the amount of acid produced by the test organism, by measuring the change in turbidity of the solution as the organisms grow, or in the case of certain molds by weighing the mycelia produced.

The use of the microbiological methods of determining the amount of B-complex vitamins necessarily poses some problems in liberating the vitamin from its bound form in the tissues. The liberation can be accomplished by several methods, namely, enzymatic, heating, acid or alkaline hydrolysis. However, in selection of a method of liberating the vitamin, it is necessary to carefully consider the properties and stability of the vitamin to the different conditions to which it will be subjected.

The use of thiochrome method for thiamine and the fluorimetric procedure for riboflavin are recommended. However, where only small quantities of the material are available for testing microbiological methods may be preferable.

AMINO ACIDS

The amino acids are usually run on meat products by microbiological procedures, but chromatographic methods also appear worthwhile.

CONCLUSIONS

Although considerable information is available on the chemical composition of meats, the surface has barely been scratched in understanding the nature of chemical changes occurring in meat, particularly during aging and processing. For certain determinations adequate methods are available, but in general, great improvement is needed in our chemical methods to give a complete explanation of the properties of meat and meat products.

- - - - - - -

MR. HANKINS: Thank you, Dr. Pearson.

Dr. Hall, will you kindly take over at this point?

# # #

DISCUSSION OF CHEMICAL METHODS

J. L. HALL
KANSAS STATE COLLEGE

The Wheeler Method and the Lea Method for Peroxides in Fat

When the survey was made on methods used in meat research, I was impressed with the preponderant favor shown toward the Wheeler method over the Lea method for peroxides, eight to three. Since I was one of the three using the Lea method, the survey made me wonder if I had been overlooking something.

Since then we have made a few parallel determinations by the two methods and found satisfactory agreement, although Lea results had a tendency to run slightly higher. On the basis of that comparison we went over to the Wheeler method because of its greater simplicity and rapidity and its avoidance of the use of carbon dioxide. The Wheeler method is better adapted to use by student help with limited training and technique.

For the most part we have been satisfied with the performance of the Wheeler method, but occasionally it becomes puzzlingly erratic. In the hands of a technician who has been having satisfactory success with it, it occasionally seems to become wholly unreliable. Replicates of the same fat extract may vary badly. I have not yet found a satisfactory explanation for this peculiar behavior, unless perhaps it may be dissolved oxygen.

As well as the circumstances can be recalled, this erratic conduct has been associated with freshly prepared fat extracts. Extracts were prepared by processing fat tissue, ethylene chloride, and anhydrous sodium sulfate together in a Waring blendor, and filtering the mixture. As soon as opportunity permits, we intend to prepare sufficient quantities of such extracts to permit a series of peroxide determinations at time intervals beginning immediately after extraction.

One of the functions of our committee should be to serve as a clearing house for observations and ideas of this nature. Any contributions of this kind will be cheerfully received and an attempt will be made to correlate them and report them back to the conference.

Collagen Determinations in Cooked Meat

In a cooperative project on cooking various cuts of commercial grade beef involving several institutions it was occasionally found that collagen appeared to increase after cooking when determined by the Hartley and Hall method. Such unseemly behavior is embarrassing, not only to the home economist who cooked the meat, but especially to the authors of the method.

The goal in developing this method was to expedite collagen determinations so that they could be done more rapidly and in batches of a greater number of samples. Such a method could mean the difference in what is feasible and what is not feasible with the means available in a project involving large numbers of samples.

It seemed to us that this goal had been reasonably well attained, but unfortunately we had used only the better grades of beef, and no such anomalous results in raw and cooked samples appeared. A number of factors are suggested to explain such a paradox. To begin with, collagen nitrogen is conventionally expressed as percent of total nitrogen. We have demonstrated that a relatively high percentage of NPN is lost by cooked meat to drippings or extractives. Collagen nitrogen is, therefore, a relatively higher percentage of the total nitrogen left in the meat. Some of our samples which showed a cooking increase in collagen when calculated on total nitrogen basis actually reversed their trend and showed a decrease when calculated on protein nitrogen basis.

Other factors could affect the results similarly, such as loss of free ammonia, and loss of water-soluble protein to drippings and extractives. But I feel that one of the most likely factors involved is the change in physical structure of the proteins by coagulation during cooking. The water-soluble extractives may be so surrounded and occluded by coagulated protein that they are not liberated by dispersion technique adequate for raw meat. This material may later be liberated during autoclaving and be included with the gelatin after the connective tissue structure is disorganized by conversion of collagen to gelatin.

This assumption was supported by attempts to apply a longer blending period, which tended to lower collagen values in cooked meat. However, such attempts were considerably frustrated by frequent excessive heating of the blendor. Probably a more vigorous pressure-shearing action is needed than is provided by the blendor. Perhaps the material could be better prepared before blending, as by use of a Latapie mill or similar device.

- - - - -

DR. HALL: Dr. Kastelic, haven't you anything to say on collagen?

DR. KASTELIC: Well, I did not wish to take the time. I was very much interested in the method of preparation of the samples. We have worked on this for about a year and a half. We have used every device we could lay our hands on, and I am sorry I cannot confirm Mr. Naumann's experiences with the use of the grinder. I do not know how he determined his reproducibility of values. We used aliquots of the ground up sample and determined the nitrogen, and we determined that as the basis of determining whether the various parts of the sample had the same nitrogen content. Following that experience and a number of others, which I won't give information on because we did not get any useful information, we sought recourse to the use of dry ice with the meat. There we achieved a very significant improvement in the duplicate values of the nitrogen as obtained from various parts, say, of the sample. However, I need not tell you about the problem you have in getting rid of the carbon dioxide after you have ground the meat with dry ice. You can reduce it to a powder. After having achieved that we thought we had something and we sought then to pursue the collagen determination. However, we found that we defeated our purpose there because we had so finely divided our connective tissue in the process of grinding with dry ice that it would not centerfuge down, and we found pieces of the connective tissue disappeared in the supernatant contained in the centrifuge tubes.

DR. HALL: Even under pH control?

DR. KASTELIC: Yes, the viscosity is too high and will not allow the material to go down. We got answers that were all over the map. We then sought other means of extracting protein from these tissues and we are now using salt extract -- K.C.L. extract -- the regular procedures used by people who work in muscle chemistry, and there we find that we have run into a lot of trouble, that while you can get satisfactory recovery of the proteins that are presumably not collagen and elastin in very fresh tissue, that is, tissue taken from the animal immediately after slaughter, you cannot do that, say, 48 hours later, and yields of proteins that we attempt to remove by salt fractionation continually go down and down, until if you repeatedly refreeze and thaw, which is the worst treatment we have found you can give it, yields of 40 per cent or less are obtainable.

Why are we interested in the salt extraction? I might tell you why. First of all, I am not convinced that the use of alkali is the only method that we should employ in the separation of protein, isolating what we might call the proteins, not collagen and elastin. With the procedure as you use it, you are measuring residual nitrogen, the nitrogen that was not included with the residues, whether we use an alkali or any other procedure. The procedure you are using may be valid, but we don't know that. So we are seeking to obtain the fibrous tissues separate from the muscle proteins. Then taking these tissues and determining the hydroxyproline content of such tissue, since, according to the literature at least, only collagen and elastin contain this particular amino acid.

We are, after one year's work, still battling, trying to get the connective tissue separated from the rest. Until we do that we do not have any collagen-elastin quantitative amounts. That is why we are at that point. Grinding was not a method of getting it. Concerning peroxide, since you raise that question, we have not been able to get concordant results with the Wheeler method. We are using Lea's method and we are using nitrogen in our samples.

I will tell you what the observations have been. Not only have they been erratic, as you indicated them to be, but they also have given this sort of thing: The larger the fat sample you take -- incidentally, we are working with lard -- the higher will your peroxide be. Only with the Lea method, which is a modification of what we are using now, titrating the samples under nitrogen, using nitrogen to wash out any remains in the samples before the additives are added, can we get values that are more or less independent of the size of the sample.

I have taken more time than I had planned.

DR. HALL: Is carbon equally effective as nitrogen?

DR. KASTELIC: We have not tried that and I don't know. It is a very convenient method.

MR. PEARSON: I thought maybe the Wisconsin people would like to say something about their method. Maybe Mr. Hankins would like to spend a minute on his antipyrine.

CHAIRMAN BRAY: That is in George Wilson's domain.

MR. WILSON: I don't know that I have very much to offer. On this matter of determining collagen, Dr. Pearson said this is a new method. Actually it isn't a new method. It is a combination method, a combination of the methods that are in the literature, and one which I received from Dr. Doty of the American Meat Institute, and if you listen to Joe back here he says this alkali method isn't the answer. I only too well agree with him on that but in principle that is what is being used. Actually the principle is the same as the methods that are in the literature, using sodium hydroxide.

DR. KASTELIC: I might say that we did not run into the same difficulty, finding more collagen in cooked samples than in raw samples, but we continued to make the steps in the procedure a little more drastic and as we now use it, it is absolutely empirical, I assure you of that, and it is not your procedure we are using. I want to correct that. It is the Lowery, Gilligan, and Castersen procedure. We have certain steps that we follow. We are now getting on the average less collagen in the cooked sample than in the raw sample, but I do not know how much the actual collagen or elastin data we are now obtaining represents.

In connection with the antipyrine, I want to make a confession here. We started some six months ago, very enthusiastically, thinking that the method used by Kraybill and Hankins on cattle could be used in connection with determining body water in light work on pigs. It is either us or the equipment that we use, but with pigs we are getting no place.

MR. HANKINS: Maybe it is the pigs.

DR. KASTELIC: However, I would be interested to know if anyone else is pursuing that because I think it is a theoretically sound method.

DR. HALL: If there are no other comments, I will turn it back to Mr. Hankins.

MR. HANKINS: Are there any other comments or questions?

I have been asked to say something on this antipyrine technic. Our Dr. Herman Kraybill actually is the person who has done that job. We think he has done very well. As many of you know, antipyrine is a drug which has the peculiar characteristic of being able to distribute itself throughout the animal body in relation to the moisture content. You are, therefore, able after a period of time to withdraw a sample and analyze it and calculate your moisture content, the total moisture in the live animal. From that then you can calculate the fat content. This method has been published as applied to cattle and I won't go into any further detail. As I have indicated, we think it has done right well in its application to cattle. We expect to work with it with other species.

Now, if there are no other comments, I will ask for a motion that this report be adopted.

MR. WANDERSTOCK: I so move.

MR. HENRICKSON: Second.

MR. HANKINS: All in favor say "aye"; opposed. The report is adopted.

Now we will go on to the microbiological phase of our report, and I will introduce Mr. Sulzbacher. Bill, if you please.

# # #

REPORT OF SUBCOMMITTEE ON MICROBIOLOGICAL METHODS OF MEAT RESEARCH

WILLIAM L. SULZBACHER
UNITED STATES DEPARTMENT OF AGRICULTURE

At the 1951 Reciprocal Meat Conference our committee presented a report on methods currently in use for microbiological phases of meat research. That report was based on a survey of methods in use by many of the leading laboratories of the country and pointed out areas of substantial agreement as well as others marked by considerable confusion. The worker in search of a prospective method might find our report helpful for certain procedures but quite the opposite for others. It therefore seems logical that as an extension of last year's report we ought now to present for your consideration tentative methods for the microbiological examination of meat and meat products. These methods are based on a combination of the survey report presented last year, on published methods and on our own experience and opinions. They are by no means final nor do they embrace the whole field of meat microbiology. They are, however, the methods that we consider to be entirely adequate for use as standard technique.

Sampling

All samples should be as truly representative as possible of the meat or meat products being studied. A sample composed of small portions from different locations will often help in attaining this. Methods of sampling large pieces of fresh and cured meat are reviewed by Jensen (3) and Tanner (6). In sampling trimmings or comminuted meats the method of pooling many separate samples is invaluable. All sampling should be done with sterile forceps, scalpels, and other necessary instruments and samples should be placed in sterile containers for rapid transportation to the laboratory. Curing brines may be sampled by using a large sterile pipette made from glass tubing and collected in a sterile flask.

Preparation of Sample

Fifth gram samples of meat should be weighed into a tared, screw capped sterile, Waring Blendor jar and 150 ml. of sterile diluent added. This mixture should be blended for 30 seconds to one minute (see discussion of Waring Blendor below) and four grams of the resulting 1:4 mixture collected by weighing into a sterile tared dilution bottle and 96 ml. of diluent added. This procedure gives a 1:100 dilution of the original sample which can then be diluted further as required in the usual manner. In cases where it is not feasible to collect 50 grams of original sample, 10 gram samples and 90 ml. of diluent can be blended and the resulting 1:10 mixture further diluted by pipetting. The latter alternative seems simpler in that it eliminates the necessity of weighing out the blended material but experience at Beltsville has shown that 50 grams of sample gives much more reliable counts than 10 grams.

Diluent

For fresh and frozen meats and meat products containing less than 3 percent sodium chloride physiological saline solution is the diluent of choice. For cured meats containing more than 3 percent sodium chloride, curing brines and similar substances, five percent sodium chloride solution should be used.

Plating Medium

Either veal infusion agar made by adding 1.5% Bacto agar to Difco Veal infusion medium or Tryptone Glucose Extract Agar (Difco) should be used for plating. In the case of samples containing more than three percent salt, five percent sodium chloride should be added to the agar. Our own experience indicates that veal infusion agar reveals more differences in colonial form and color than TGE agar and we prefer it for that reason. Comparative counts using both agars in experiments at Beltsville have not shown any difference in total number of organisms recovered.

Incubation

Since meat and most meat products are normally kept in refrigerators, 20° C. is the best incubation temperature because it encourages growth of a more representative meat flora than higher temperatures. Plates incubated at 20° C. should be held for 72 to 96 hours before counting. Where specific groups of microorganisms are sought, an incubation temperature close to the optimum temperature of the organisms should be chosen.

Reporting Results

Counts should be recorded and averaged logarithmically as described in the A P H A standard method (1) and reported as organisms per gram of meat.

Techniques for Special Groups of Microorganisms

Yeasts and molds should be counted by plating the prepared sample (see above) on acidified dextrose agar. This can best be accomplished by adding one ml. of a sterile solution containing 50 percent dextrose and five percent tartaric acid to each plate just prior to pouring the agar.

Coliform organisms can be determined by adding portions of the appropriate dilutions to tubes of brilliant green lactose broth and estimating the coliform count by the most probable technique of Hoskins (2).

Lipase forming microorganisms can be estimated by the Jensen-Turner (3) method or by the modification of that method described by Sulzbacher (5).

Oxidase forming microorganisms can be estimated by flooding plates with a one percent solution of p-aminodimethylanaline oxalate (Eastman). Colonies of oxidase positive bacteria will turn a bright bluish purple color in a brief time.

Routine methods are available for certain other groups of interest to meat bacteriologists. Tanner (6) describes or quotes references for many of these and both Difco and Baltimore Biological Laboratories publish information on the use of special media for isolating specific organisms. Enterococci and staphylococci are mentioned as examples of such groups of organisms. Although routine methods exist for their isolation and enumeration we do not consider them sufficiently well established for inclusion in these proposals at this time.

Waring Blendor Sampling

In the past 10 years more and more laboratory workers have turned to the Waring Blendor as a tool for preparing mixtures of solids and liquids. Bacteriologists have been particularly pleased with the ease with which mixtures could be prepared for plating by this handy device. Workers in meat laboratories have been almost unanimous in adopting the Waring Blendor because meat presents many sampling difficulties that are easily overcome by its use. I was very much interested, therefore, in a paper by Jones and Ferguson (4) pointing out certain disadvantages to the bacteriologist of Waring Blendor sampling. Nor was I the only worker so impressed. In fact, during the past several months the question of the proper use of the Waring Blendor has occasioned considerable discussion among food bacteriologists everywhere. It seems only fair then, since we are recommending the Waring Blendor for the comminution of meat samples for plate counts, that some account be presented to this group of the problems involved and our conclusions regarding their solution. Briefly, Jones and Ferguson observed that when dehydrated vegetables were sampled in a Waring Blendor considerably lower counts were obtained than when a shaking machine was used; that with a miscellaneous group of food samples some higher and some lower counts resulted when the Waring Blendor was used; and that with pure cultures of microorganisms lower counts were obtained with the Blendor than with a shaking machine, except for one culture of Sarcina which produced clumps. The advantages to meat work of using the Blendor are so great and because of the difficulty of obtaining a homogeneous meat suspension by other means, I am disposed to continue its use unless much stronger evidence against it is brought forward. However, we are now in the process, at Beltsville, of reanalyzing our counting technique in the light of Jones' and Ferguson's findings. Table 1 presents the results of a preliminary experiment showing the effect of length of blending time and sample size on bacterial counts. All samples were ground meat and samples C-1 through C-4 were all subsamples of the same lot of meat. In general, the data in table 1 seemed to indicate less variation in count due to differences in blending time than the differences imposed by taking successive samples of the same batch of meat. Before definite conclusions can be drawn we must repeat this work with several carefully prepared uniform samples. These preliminary data do serve, however, to emphasize certain elementary precautions that should be observed in the use of the Waring Blendor. These are:

1. Blendor jars must be kept in good mechanical condition. The largest heat rise we have noted is 10° C. in 3 minutes. This is not excessive but it would be much greater if the blending mechanism were permitted to corrode and tighten.

2. Mix for as short a time as possible to obtain good homogeneous mixtures. Ground meat or sausage can be adequately suspended in 20 seconds or less. Chunks of fresh meat may take as long as 45 to 60 seconds and frozen meat even longer. It is almost never necessary to mix a meat sample as long as 3 minutes to get a good suspension.

Table 1. - Counts (org./gm.) of Sample Portions Withdrawn After Various Blending Times

Sample		Time in Blendor				
Number	Size	20 sec.	30 sec.	1 min.	2 min.	3 min.
A	10		13,000	18,000		17,000
B	50	83,500			85,000	
C-1	10		169 x 10^6	160 x 10^6		160 x 10^6
C-2	10			129 x 10^6		136 x 10^6
C-3	10					144 x 10^6
C-4	50	198 x 10^6			189 x 10^6	

Dr. Kastelic and myself, the members of the Microbiological Subcommittee, sincerely hope that the foregoing proposed methods for microbial meat analyses will prove helpful in your research work and that this Conference will serve as a starting point from which generally accepted standard methods for meat research in all its phases can eventually be established.

References

1. American Public Health Association. Standard Methods for the Analysis of Dairy Products. 8th Ed. 1941

2. Hoskins, J. K. Most probably numbers for the evaluation of coli-aerogenes tests by fermentation tube method. Public Health Reports 49, 393 (1934)

3. Jensen, L. B. Microbiology of Meats 2d Ed. 1945

4. Jones, A. H. and Ferguson, W. E. A study of methods of preparing food products for microbiological analysis. Food Research 16, 126-132 (1951)

5. Sulzbacher, W. L. Survival of microorganisms in frozen meat. Food Tech. 4, 386-390 (1950)

6. Tanner, F. W. The Microbiology of Foods 2d Ed. 1944.

- - - - - -

MR. HANKINS: Thank you, Mr. Sulzbacher.

Dr. Kastelic, have you something to say?

DR. KASTELIC: No, I don't have much to say. I would just like to say one thing as far as I am concerned personally. I have a feeling that we should be very much more critical of methods, procedures, and so on. I think if we are going to call ourselves scientists or research workers we must be. That does not mean to say that we should tear everything apart, but I certainly think that we should look to the validity of the procedures or the statements that may be offered concerning procedures or methods of measurements.

I want to make only one more comment. It is concerning the use of the Waring blendor. I concur with Dr. Sulzbacher about the heating of the blendor if it is not in a good state of repair. We particularly were concerned with it because we felt that homogenizing a tissue in the Waring blendor might result in subsequent degeneration because of the heat rise, and we used ice cold solutions, ice cold blendor jars and cold everything, and we found that in three minutes you can get an appreciable temperature rise. However, in looking in the literature, we know that some Canadian workers, Snow particularly at the Atlantic Fisheries, have described a baffle that you can drop inside the jar, made out of plastic or perhaps of some other material, of the general outline of the inside of the jar. You drop it in and it breaks up the vortex. We find that it very considerably decreases foaming. There is much less air beaten into the material that is being homogenized. However, it greatly adds to the load of the motor driving the blades and you will notice a susceptible slowing up of the motor. That may be of some interest to you. The details are given in this article of Snow's in one of the fishery publications. If you are interested, I can get it for you.

MR. HANKINS: Are there any comments or questions?

MR. HENRICKSON: I just want to say that we, too, are interested in this problem of the use of the Waring blendor, and we find that in working with various types of products, that we need to blend the products for a longer period of time. In some preliminary work over a period of one minute through eight minutes we found that the time required to blend and to get it through the pipette varied with the type of sausage product we might be working with, and we found that two minutes on some of them and three minutes on others was the most desirable blending time.

I just wonder, too, why we specify the screw cap on the blendor.

MR. SULZBACHER: Maybe I should explain something further. Skill in pipetting is very important to the bacteriologist using the Waring blendor. For handling 50-gram samples we use a straight-side tube pipette not constricted, and draw out four grams. We draw up a quantity and weigh it in a square jar. The reason is that you just cannot pipette a heavy 1:4 mix with a volumetric pipette. For this particular sample the blendor was just a whipped mass of ham and moisture. It is still better than blending with sand and water.

The screw cap is used because we sterilize these jars well in advance of when we need them. We have about 20 jars that we keep sterilized all the time in the cupboard. These are smaller jars than the jars with the loose bakelite caps and they are heat-resistant caps. They are generally more convenient. They fill on the balanced tray better. The screw cap stays on. It is more watertight, and I think they probably stand up better with continued use because of being able to use this flask.

DR. KASTELIC: Do you use any anti-foams?

MR. SULZBACHER: We have not. In the case of sausage and frozen meat, if you let the sample set for about a half minute, the foam subsides enough so that you can get material underneath with very little air. In the case of some of the ham samples, the fat has been sufficiently hydrolyzed that it will foam badly and even have a whipped cream effect, but that is very unusual. You don't often find it.

DR. HALL: That reminds me of some other whimsies that the Waring blendor jars are subject to some times -- new ones that we inspect. I have seen a new blendor jar in which the blades were set to run counter to the direction in which the motor turned them so that you cut with the back side of the blade instead of the sharp side.

MR. SULZBACHER: I have found that in about half the jars.

DR. HALL: And I have found jars in which the blades were crossed. One cut one way and the other cut the other way. So it was bound to be right half the time.

Another point is that the blades are seldom sharp. If you want to get the best efficiency out of it, it is a good idea to disassemble it and take the blades out and sharpen them before you use it.

MR. HANKINS: Is there anyone else? Do I hear a motion to adopt?

MR. RUST: I so move.

MR. HENRICKSON: Second.

MR. HANKINS: It has been moved and seconded that this report be adopted. All in favor say "aye"; opposed. It is adopted.

Now we will go to the discussion of organoleptic procedures. Dr. Johnson.

DR. JOHNSON: Dr. Deatherage has handed me this report and I am sure it is going to be short. I won't say anything about how sweet. It reads as follows:

"The subcommittee on organoleptic methods last year gave a survey of the methods in use in meats research. This subcommittee was directed by the conference to follow up on seven institutions which sent in questionnaires in 1951, yet did not indicate the degree of reproducibility of tenderness determinations by taste panels. This has been done. Only two of the seven institutions replied but these replies gave no additional information. Consequently the 1951 report of this subcommittee will remain unchanged."

(The following paper was also submitted by Mr. Deatherage for inclusion in the proceedings)

# # #

THE CHEMISTRY OF FRESH MEAT AND ITS RELATION TO TENDERNESS AND OTHER PALATABILITY FACTORS

F. E. DEATHERAGE
OHIO STATE UNIVERSITY

The title of this paper implies that much is known concerning the fundamental nature of the quality in fresh meat. This is not the case. Consequently, this paper may differ basically from the others in this symposium in that the others cover areas where much more fundamental knowledge exists and in many cases has been commercially applied. So, perhaps it will not be amiss if we spend a moment to appraise the consumer's fresh meat problems from the point of view of a chemist.

America's eating habits have their very foundation on meat. The fact that the per capita meat consumption is almost the greatest in history while prices seem high indicates that the consumer wants even more meat. What kind of meat? Lean meat without too much fat; tender, and juicy meat; meat full of flavor, and lots of it at the lowest possible cost. Our expanding population will continue to put greater demands on our meat supply. We can ask what makes a good piece of meat. The chemist looks to find the answer in fundamental concepts of the chemistry of meat itself, or in the biochemistry, physiology, and nutrition of the meat animal, or in the breeding and feeding management practices in livestock production. He finds very little information on the relation of these factors to what the consumer really wants even though it is the consumer who should set the market.

It is not our desire to go into the many reasons for this state of affairs, but as one examines this situation, perhaps two things stand out: (1) the meat packing industry has spent vast sums for research resulting in many technical advances; yet has not, in the past, been very much concerned with fresh meat investigations as long as the consumer didn't complain about spoilage; (2) and more seriously, livestock production research in our universities and experiment stations both state and national, have been carried on for the most part without regard to the consumer quality of the resulting carcass except in a rather superficial way. More meat animals of known breeding and feeding management should be studied for yields of edible lean, tender and juicy meat at the lowest cost rather than production research stopping at the stockyard scales or stock show. Several research institutions are just beginning to carry on investigations incorporating the consumer's point of view into their meat and livestock production programs.

From the standpoint of the investigator, one great obstacle has prevented effective meat research from the consumer's point of view even though many have realized the desirability of studies in this area. The stumbling block has been methods. How can one determine consumer desires. If the consumer is indeed the one to be pleased then the desires of the consumer must necessarily be the primary standard. Livestock producers and marketers use expert judgments for appraisal of live animal and carcass values involving tremendous sums of money yet these same groups appear somewhat afraid to eat their product and then grade it as to its eating and table quality. To the biochemist such an approach may not be such an obstacle for he knows that bioassay techniques brought forth the science of nutrition and developed many areas of quantitative biology. One may ask in an abstract way, "Does the superposition of an intellect make a biological system incapable of making quantitative evaluations?" The answer should be an obvious, NO! In the remaining time, I shall try to show what has been done in trying to understand in fundamental terms what makes a steak tender, juicy and full of flavor.

Since American's consume more beef than any other meat and since beef presents the greatest variations in quality, this paper will deal with beef unless otherwise indicated.

Generally, meat is skeletal muscle. The biochemistry and physiology of this tissue is being understood by the pioneering efforts of Szent-Gyorgi (1). Many properties of meat can be best interpreted from the wealth of fundamental information brought together by this eminent scientist. Another pioneer, E. C. Bate-Smith, carried on investigations on the chemistry of post mortem changes in muscle. His recent review of this subject is well known (2).

The histologists tell us that structurally meat may be considered as a group of long slender cells of thin wall and containing a fluid which might be called muscle plasma. These cells may be considered intertwined with blood vessels and spliced together transversely and longitudinally into bundles by connective tissue fibers. The muscle cell membranes themselves terminally converge to form connective tissue fibrils and finally tendons which attach the muscle to bone or other muscle. Quantitatively, the muscle plasma accounts for 90% more or less, of the muscle substance. This may be considered as a gel composed of highly hydrated protein. In these different tissues reside the answers to consumer's likes and dislikes. With this background let us proceed.

The consumer demands tender, flavorful and juicy meat at the lowest possible cost. If the meat is tough, it is generally objectionable, irrespective of all other qualities, and it is this quality that has been studied with the greatest degree of success.

Tenderness (or any quality) must be measurable in quantitative terms in a reproducible manner in order to be studied. Furthermore, the consumer must set the primary standard. Many producers of food products, consumer goods, or even automobiles know that consumer's likes and dislikes can be determined by sampling a population in a statistically sound manner and then studying responses of these consumers. As a research tool, the taste panel has been found useful if applied in the same way. Indeed, a properly selected panel has been shown to evaluate tenderness on a quantitative basis as comparable and reproducible as many widely accepted bioassay techniques in common usage. The first rigid application of taste testing for tenderness was perhaps that of Cover (3,4,5,6) although some earlier attempts at taste testing have been made (presumably unsatisfactorily) following the scheme of the National Co-operative Meats Investigations Committee (7). In her technique, Cover used paired sampling for preference judgments only and has shown that roasts cooked to the well done stage are less tender than the same meat roasted to the medium rare stage, and also that rate of cooking effects tenderness---the slower the cooking the more tender the meat.

Deatherage and Reiman (8) reported a method for determining tenderness incorporating the features of Cover plus the evaluation of the tenderness level on a 0 to 10 scale with ten being perfect. A group of six judges using segments of broiled steaks were found to be reproducible to 0.5 of a point. Husaini, et al (9) have confirmed this degree of accuracy. Recently in a survey of meat research methods in use in this country (10) several other laboratories indicated a similar degree of reproducibility.

There have been attempts to design instruments to measure tenderness in a so-called objective manner. The most widely accepted of these is the Warner-Bratzler shear machine (11). In our experience, it gives data which are not as reliable nor as reproducible as the taste panel data.

The machine of Vokodkevich (12) measures toughness as the area under a load displacement curve as the meat sample is compressed between two semi-cylinders. A detailed study of this, or a similar type of instrument (as Winkler's) (13) seems desirable.

If one reflects a moment on the nature of meat, it is immediately apparent that cooking meat involves denaturation and coagulation of the proteins and the higher the temperature that the meat gets the greater the degree of coagulation. This of course, explains the work of Cover in that the same meat cooked to the well done stage is tougher than if cooked medium rare. Of course, if meat is cooked sufficiently to convert the collagen to gelatin or to promote hydrolysis a tenderizing effect is noted. If there is protein degradation prior to cooking as in aging or slow cooking (for example, the barbecue pit or very slow oven), one should expect a softer coagulum and more tender meat.

What tissues are involved in these changes? Connective tissue was commonly considered as causing toughness. Steiner (14,15) using the tenderness tester of Vokodkevich (12), showed that both muscle plasma and connective tissue were involved. In a statistical analysis of taste test data on 438 different beef loins, Deatherage and Reiman (8) found evidence that at least two major factors appear to be involved in tenderness. Similar confirmatory data have been accumulated in Ohio, but not published. Deatherage and Harsham (16) also report evidence to support the view that both connective tissue and muscle plasma contribute to tenderness. These authors studied the relation of time of aging at 33° F. to tenderness over a period of 39 days and found that tenderness was not a smoothly increasing function with aging time. These results give some quantitative idea of the effect of aging on tenderness and also support the view of Steiner (14,15).

Quite a number of histological studies in different species indicate that initial post mortem changes involve the muscle plasma rather than connective tissue, so it may be that changes here are most important during initial aging period and that in later post mortem stages muscle plasma is less important than connective tissue in contributing to toughness.

In studying the contribution of each phase toward tenderness, one is immediately faced with both quantitative and qualitative considerations. For example, how much muscle plasma is there and how hard a structure is formed when it is cooked, or how much connective tissue and how strong is it? Two other perplexing problems confront those who are trying to understand meat quality and these are uncontrolled variations in animals necessitating detailed study of a large number of samples and the problem of sampling carcasses for accurate and meaningful data since meat is a very heterogeneous product.

Lehman (17) was perhaps the first to show a positive relation between the amount of connective tissue and toughness of different muscles. Mitchell, et al (18) expanded this work and so has Prudent (19). Husaini, et al (9) reports that alkali insoluble protein (as an approximation of connective tissue) correlates well with tenderness at 15 days post mortem in a group of market cattle of wide difference in quality. In a more homogeneous group of cattle, this relation was not so close (20). This determination has much to be desired and it is being studied further. In this study no relation between other nitrogenous fractions and tenderness was observed. An interesting lesson in sampling may be reported here. We use a standard sampling technique using the shortloin for taste tests and chemical analysis. Samples are cut perpendicular to the spinal column. It has been observed that the loin is relatively uniform in tenderness. However, when samples are used from the anterior portion of the loin an excellent correlation is found between tenderness and connective tissue whereas when the posterior end is used only poor correlation results. At present this is interpreted as follows: at the posterior end the direction of the fibers change altering the sample for chemical study whereas the taster automatically adjusts the sample to give the greatest mechanical advantage on chewing. Hence the tenderness score is the same but chemical composition is more variable.

It is well known that meat increases in tenderness with post mortem age. Husaini, et al (9,20) were unable to detect changes in nitrogen fractions by the method of Van Slyke and Hiller (21) which could be related to tenderness changes. They did indicate a relation might exist between total muscle plasma and tenderness changes. Theses results are interpreted as meaning that the post mortem changes which give rise to the greatest changes in tenderness are much too subtle to be measured by classical techniques.

Some information might be mentioned which gives some insight into the nature of these changes in tenderness. It has been established that the rate of tenderization is a function of temperature. Disclosures in recent patents (22,23) together with other published information permit estimation of a temperature coefficient of 2 to 3 fold for each 18° above 32°F. until protein denaturation sets in. This explains the tenderization on slow cooking. This further lends credence to the assumption that tenderization on aging is enzymic and in particular proteolytic. It has been assumed (but not proved (24,25)), that the enzymes responsible for these post mortem changes are catheptic in nature. This group of enzymes have an optimum pH of about 4.7 which is in the range of the isoelectric point of most meat proteins. If this is the case then the natural anaerobic glycolysis after slaughter tends to develop a favorable condition for the proteolysis because the lactic acid developed brings most meat to a pH of 5.4 to 5.5.

It usually requires 40-48 hours for a carcass to reach the minimum pH and by this time it is usually chilled below 40°F. A recent patent (23) discloses that if an animal or carcass immediately after slaughter is stimulated while the musculature is still irritable the minimum pH will be reached in a few hours and before the carcass has chilled. This combination of low pH and higher temperatures while the carcass is chilling hastens natural tenderization.

There have been a number of reports that meat taken immediately at slaughter is tender on cooking and that the meat toughens as it chills out, and then it becomes tender again in aging. Ramsbottom and Strandine's report (26) is the most recent and complete. A possible explanation of this might be that at the high pH at slaughter the proteins occur as highly hydrated gels removed from their isoelectric point and the resulting coagulum on cooking is more hydrated and more tender while the same meat at 48 hours is nearer its isoelectric point and the coagulum is less hydrated and less tender. A critical study of the changes in tenderness in beef which has pH values higher than normal meat might clarify the relation of pH to tenderness.

It appears that changes in muscle plasma are more closely associated with increases in tenderness during early aging whereas tenderness at 14 days or more is largely a function of connective tissues. If this is true, one should expect a great variation in animals on the relative importance of the plasma and the connective tissue. Indeed, this is the case; some meat is never tough while some never seems to become tender on aging while still other meat shows great changes on aging. This interpretation on the nature of tenderness may serve as a guide for further meat and livestock production research. Even so it is not difficult to see that much more needs to be done to understand the nature of tenderness.

Juiciness is another mark of a good piece of meat but it is somewhat more difficult to measure. Here again the primary standard is the consumer. One might suppose that all that is necessary is to cook the meat, press out and measure the juice. This is not the case for the salivation of the consumer is very important. In common language the meat must make your mouth water. Sartorius and Child (27,28) noted that quantity of press fluid does not correlate with juiciness scores, and this has been adequately confirmed by others (10). They also point out that there is a positive correlation between tenderness and juiciness. This has been confirmed in our laboratory (29). Recently Gaddis and Hankins (30) showed a relation between juiciness scores and the petroleum ether soluble matter in the press juice. This report contradicts the work of Sartorius and Child but the differences are at once reconciled on examining the data in the later work. There appears to be a limiting value beyond which the amount of fat in the press fluid does not contribute to juiciness. This finding explains some results reported from Ohio regarding the effect of intramuscular fat or marbling on tenderness and juiciness.

In short, juiciness appears to be related to the other quality attributes of the meat and hence to the receptiveness of the consumer.

In flavor of meat the guiding principle has been that if the flavor is not objectionable it is satisfactory and with proper meat handling no objectionable flavor will develop. This is a rather negative attitude. There have been a few reports on the effect of ration on meat flavor but the greatest advances in understanding the chemistry of flavor and flavor development have been made in other fields. It is well known that cooking brings out the flavor. There are chemical changes going on such as the production of volatile water and ether soluble compounds and some of these perhaps contain sulfur (31). The more definitive reports of Bouthilet (32) mark a starting point in this almost totally unexplored field where techniques are just being developed as indicated by Peryam and Swartz (33).

As we think of tender, juicy and flavorful meat we naturally ask what is the relation between these factors and market grade? Up to now very little critical study of this has been made. This is an important question in economics as well as consumer desires for often grade and consumer quality may not go hand in hand (8,9,20). It is good that the American Meat Institute is now conducting such a study in cooperation with Federal meat grading authorities. A complete report of this comprehensive project will give all of us much useful information. A preliminary paper on this study is by Wang (34) on a histochemical study of U. S. Choice and U. S. Commercial beef.

This paper has dealt with meat as it comes from the packer. The point of view has been that of a chemist studying meat quality in terms of tenderness, juiciness and flavor. We would be negligent if we did not point out that consumer acceptance must also be understood from the production side; the biochemist, the physiologist, the geneticist, the nutritionist and the practical breeder, feeder, and merchandiser must cooperate to produce the animals that the consumer wants at the lowest cost per cut of meat. To do this it is essential that animal production research be guided by real consumer quality defined in fundamental terms. This has been and still is a neglected field. Here is where agricultural experiment stations can make a long needed contribution to the American way of life. By conducting meat research and carrying on live stock production programs from the consumers point of view as well as the producers, progress can be made similar to that made in many other areas of agriculture. I am reminded of a geneticist friend of mine who is a very successful soft wheat breeder. He insists that his new strains of wheat must be millable and make good cakes and cookies as well as being able to give high yields of a harvestable wheat. To illustrate what I mean in a different way. Another friend in sheep production research (lamb chops if you will) indicates that during the last sixty years the breeding of one of our important mutton breeds for show stock has resulted in a drop in lambs reared from 168 to 103 per 100 gestations (35,36). Not only did the twinning rate drop but also the size of the lamb and yield of meat. This means less attractive producer profits and fewer and costlier lamb chops.

As this paper is brought to a close we may say that meat research is truly a babe in arms. What can be done by an over all production-consumer research program is shown in a number of studies which are rather isolated. Bull and Rusk (37) showed that steers which were exercised made as good as or better beef than strictly confined feed lot steers. Madsen and Earle (38) pointed out that many fattening rations are deficient in vitamin A yet the effect of this on meat quality is not known. In a recent study in Ohio where steers showing different rates of gain were investigated an incidental finding indicated that perhaps vitamin A deficiency might be related to marbling which has long been considered a mark of quality in beef (29). In this same group of steers it was found that faster growing steers gave as good meat as slower growing steers and that there were no differences in yield of edible meat or waste fat. In still another group of steers the rates and efficiency of gain showed Herefords and Holsteins comparable on the same feeding management (20). Furthermore, when the meat was eaten it was not possible to tell which was which. We are currently concluding a study on the effect of age at castration on meat quality as well as meat production efficiency. Preliminary results indicate

If all their carcasses are studied for consumer quality one of the most complete projects of this kind will be that currently underway in Great Britain where a large number of cattle including a beef breed, Hereford; a dairy breed, Fresian, and dual purpose, Shorthorn, are being fed on four different feeding managements. This study comprises 6 spring crops of calves, and was begun in 1946. The interim report (39) indicates that a well fed calf to 8 months and changed to a moderate grass fattening ration produces beef at the lowest cost in contrast to a so called high diet throughout life, or a limited diet for 8 months followed by either high or limited diet to slaughter. Similar comprehensive meat research is not beyond the scope of many research institutions. Much livestock production research is going on. It needs to include the consumer in its planning and a more complete study of the carcasses of known history and management now being produced in these institutions. Indeed, often the most fruitful and the least expensive research in the long run is the most complete and carefully planned program.

I hope that this paper has served a dual-purpose-to review the chemistry of fresh meat in relation to consumer quality as tenderness, juiciness and flavor and to show the need for intensified investigations on how all of us may have more delicious meat cheaper. To accomplish this it is necessary to have the interest and cooperation of the cattle breeder, feeder, packer and consumer, agricultural economists and scientists. All along the way the chemist must contribute toward putting more good meat into more mouths, more often.

Literature Cited

1. A. Szent-Gyorgyi. Chemistry of Muscular Contraction, 2nd Ed., Academic Press, Inc., New York, 1951.

2. E. C. Bate Smith. Physiology and chemistry of rigor mortis with Special reference to aging of meat. Advances in Food Research, Academic Press, Inc., New York 1: 1 (1948).

3. Sylvia Cover. A new subjective method of testing tenderness in meat -- the paired eating method. Food Research 1: 287-295 (1936).

4. Sylvia Cover. The effect of temperature and time of cooking on the tenderness of roasts. Texas Agr. Expt. Sta. Bull. 542 (1937).

5. Sylvia Cover. Some modifications of the paired eating methods in meat cookery research. Food Research 5: 379-394 (1940).

6. Sylvia Cover. Effect of metal skewers on cooking time and tenderness of beef. Food Research 6: 233-238 (1941).

7. Conference on Cooperative Meat Investigations. State Agricultural Experiment Stations, United States Department of Agriculture, Livestock and Meat Industry Participating. Report of Review Committee Vol. I (1937).

8. F. E. Deatherage and Walter Reiman. Measurement of beef tenderness and tenderization by the Tenderay process. Food Research 11: 525-534 (1946).

9. S. A. Husaini, F. E. Deatherage, L. E. Kunkle and H. N. Drandt. Studies on Meat I. The biochemistry of beef as related to tenderness. Food Technology 4: 313-316 (1950).

10. F. E. Deatherage. A survey of the organoleptic testing methods used in meats research. A report of the subcommittee on organoleptic testing. Committee on Research Methods, 4th Annual Reciprocal Meat Conference, National Live Stock and Meat Board, Chicago, 1951.

11. L. S. Bratzler. Measuring the tenderness of beef by means of a mechanical shear. Master's Thesis, Kansas State College. 1932.

12. N. N. Volodkevich. Apparatus for measurements of chewing resistance or tenderness of foodstuffs. Food Research 3: 221 (1938).

13. C. A. Winkler. Tenderness of Meat I. A recording apparatus for its estimation and relation between pH and tenderness. Can. J. Research 17D: 8 (1939).

14. Gerolf Steiner. The post-mortem changes in beef muscle at various temperatures. Arch. Hyg. 121: 193 (1939).

15. Gerolf Steiner. Mechanical measurements of toughness in meat. 8. Fleisch-u-Milchhyg 50: 61-74 (1939).

16. F. E. Deatherage and A. Harsham Relation of tenderness of beef to aging time at 33-35°F. Food Research 12: 164 (1947).

17. K. B. Lehmann. Studies on the causes of toughness in meats. Arch. Hyg. 63: 134-179 (1907).

18. H. H. Mitchell, T. S. Hamilton and W. T. Haines. Some factors affecting the connective tissue content of beef muscles. J. Nutrition 1: 165-178 (1928).

19. Inez Prudent. The collagen and elastin content of four beef muscles aged varying periods of time. Ph. D. Dissertation, Iowa State College, 1947.

20. S. A. Husaini, F. E. Deatherage and L. E. Kunkle. Studies in Meat II. Observations on the relation of biochemical factors to changes in tenderness. Food Technology 4: 366-369 (1950).

21. A. Hiller and D. D. Van Slyke. A study of certain protein precipitants. J. Biol. Chem. 53: 253-267 (1922).

22. Robert F. James. Process for treating meat and product thereof U. S. Patent 2, 169, 081 (1939).

23. Albert Harsham and Fred E. Deatherage. Tenderization of meat. U. S. Patent 2, 544, 681 (1951).

24. I. A. Smorodintsev and N. V. Nikolaeva. Modification of cathepsin during autolysis of muscular tissue. Compt. rend. acad. sci. U.R.S.S. N.S. 3: 375 (1936).

25. I. A. Smorodintsev and N. V. Nikolaeva. Changes in activity of peptidase on autolysis of muscular tissue. Compt. rend. acad. sci. 34: 223 (1942).

26. J. M. Ramsbottom and E. J. Strandine. Initial physical and chemical changes in beef as related to tenderness. J. Animal Sci. 8: 398-410 (1949).

27. Mary J. Sartorius and Alice M. Child. Effect of coagulation on press fluid, shear force, muscle cell diameter, and composition of beef muscle. Food Research 3: 619-626 (1938).

28. Mary J. Sartorius and Alice M. Child. Problems in meat research. I Four comparable cuts from one animal. II Reliability of judges scores. Food Research 3: 627-635 (1938).

29. Truman Hershberger, Robert Deans, L. E. Kunkle, Paul Gerlaugh and F. E. Deatherage. Studies on Meat III. The relation of certain feeding management practices to the biochemistry and quality of meat. (In press).

30. A. M. Gaddis, O. G. Hankins, and R. L. Hiner. Relationships between the amount and composition of press fluid, palatability, and other factors of meat. Food Technology 4: 498-503 (1950).

31. E. C. Crocker. Flavor of meat. Food Research 13: 179 (1948).

32. Robert J. Bouthilet. Chicken flavor. The source of the meat flavor component. Food Research 16: 201-204 (1951).

33. David R. Peryam and VeNona W. Swartz. Food Technology 4: 390 (1950).

34. Hsi Wang. Histologic study of fresh and aged beef ribeye (longissimus dorsi) and the outside round (semitendinosus) muscles. J. Animal Science 9: 645 (1950).

35. Charles S. Plumb. Types and Breeds of Farm Animals, Ginn and Co., Boston, 1920. p. 360-361.

36. D. S. Bell. Private communication 1951.

37. Sleeter Bull and H. P. Rusk. Effect of exercise on the quality of beef. Ill. Agr. Expt. Sta. Bull. 488 (1942).

38. Louis L. Madsen and I. P. Earle. Some observations on beef cattle affected with generalized edema or anasarca due to vitamin A deficiency. J. Nutrition 34: 603 (1947).

39. A. J. Brooks and Lilian S. Vincent. Beef production experiment at Cambridge. Interim report. J. Royal Agr. Soc. of England 1950 III 99-118.

- - - - - - - -

DR. JOHNSON: I might say that at the Florida station during the last year they have made a comparison of organoleptic determinations, comparing them with the Warner-Bratzler shear test method, and they determined a coefficient correlation of 7.2. Maybe Dr. Pearson would like to enlarge on that report.

DR. PEARSON: I might say in that regard that they actually had 12 people on the panel. There were six men and six women and most of the men on the panel had previous palatability experience and the girls had been selected on threshold tests. Actually, the girls were from the horticultural department who maintain a panel at all times. We ran them separate to see if we found any difference between the girls and the men. We found identical correlations in each group.

DR. JOHNSON: Anyone else have anything to contribute? I guess everybody is ready to rush to the door.

MR. COLE: I would like to ask how important you think these threshold tests are. I am of the opinion that maybe getting the panel acquainted with what they are doing is about as important as threshold tests. In other words, getting them acquainted with what is good and what is not good. Has anybody anything to offer on that?

DR. KASTELIC: I think that would be all right, but what will you use as your sample? Take lard for example. You are going to say that you have a good lard. Where are you going to get it? Who is going to describe it for you in order to use it? I realize that my asking that question might sound silly on the surface but it is a job.

MR. COLE: Well, I have, for instance, a sample like this. Take meat that is pot roasted, we will say, one that is braised, and another one that is broiled. The broiled meat may be tougher. You may have more flour in the braised meat and the braised will be more tender but not have the flavor. You might have some people who think that tenderness is the ideal and others go to flavor. I think just a simple thing like that is about as important as whether we can tell bitter from sweet and sweet from sour.

DR. KASTELIC: Well, I had in mind, too, Mr. Cole, the idea of some people not wanting to eat rare meat. You have a panel and you want to test, say, the cooking temperature on the palatability of beef. Some people almost faint at the sight of red meat. Others want it cooked until it is the consistency of shoe leather. Are you suggesting that we should select a panel that will find one kind acceptable as contrasted to the other kind?

DR. JOHNSON: My own experience with a palatability panel was with bacon. After going over the data from that I decided that as far as acceptability was concerned and flavor, probably in generalities it told me something. But as for any one specific trait, I think very little was learned by the use of the panel. I think there are a few things to consider when you do use a taste panel. That you do not have too many factors that you want to obtain information on. In other words, you don't want to obtain information on tenderness, color and rancidity on about six or seven of them all at once or you will get nothing on all of them.

MR. HANKINS: Don't we have two different jobs there? This isn't new. I think we have all talked about it. There are two ways of doing the job. One is to evaluate with respect to tenderness, flavor and what have you, whatever you take into consideration in the particular case and the other is preference. They are two different things. You have all heard that discussed. Obviously, you cannot get a very good preference job done unless you have a relatively large group of people. On the other hand, you may get a right decent kind of job done on evaluation with respect to tenderness and flavor and maybe two or three other things on a half dozen pieces of meat with a panel of three, five or seven people. So it seems to me we have to keep that obvious difference in mind.

MR. COLE: Mr. Hankins, I should like to ask this question. Suppose your school says, "We want to set up an organoleptic panel," are you ready to say that they need threshold tests before they can start this panel?

MR. HANKINS: I think it would be highly desirable and to leave those out who have a very high threshold, who don't taste anything until you get way up there somewhere.

DR. HALL: One other little point. Some times a person gets on one of these committees for judging meat who habitually avoids all fat. That person is asked to judge the desirability of fat in the sample that is presented to be judged, and will obviously have a very different idea about the desirability of fat since he does not like fat anyhow in the first place than one who can eat the entire cut. I think some screening from that standpoint is really necessary.

DR. JOHNSON: I think the panel has to be selected. I don't think you can go on the street and pick up ten people.

MR. HANKINS: Maybe Larry Kunkle has something to say on this point.

MR. KUNKLE: I prefer to be a listener, O. G. I think some of you have heard us say before -- and I will just repeat -- that we were doubting Thomases until we got into it, and if our experience is worth anything to you, it is simply this: You will be amazed as six people sit at a table and sample unidentified samples in duplicate and report by number and find out that they do eat for tenderness remarkably alike. I will agree that we have had some experiences. One fellow in our own experience thought his seat was worth $50 in the event there was to be any change in the panel. In another instance we had an individual who was over-imbued with the importance of the job, and she felt that she had to use her eyes as well as her jaws and her brain to decide how these numbers matched up. She was finally excused because she confessed she thought that No. 19 and No. 7 were mates, and she scored one too low or she scored them alike, and, of course, one was from a bull and one was from a choice steer.

I suspect if there is any consolation to pass on it would be this: For those who have not tried this panel business for evaluating the tenderness of samples of beef, I would recommend that perhaps it be included in next year's order of business and if possible we organize ourselves to try it out right here.

DR. KASTELIC: I think we should concur with you.

MR. HANKINS: Is there anything else?

I don't regret that we don't have much of a report to be adopted at this time, but I suppose we ought to go through the formality if I can find someone to make such a motion.

MR. KUNKLE: I will so move.

DR. PEARSON: Second.

MR. HANKINS: All in favor say "aye"; opposed. It is actually passed. Thank you very much.

Have we omitted anything? If not, that concludes our presentation, and we thank you very much.

CHAIRMAN BRAY: Thank you, Mr. Hankins.

Before we turn to the business session, let's have a two-minute stretch.

(Recess)

CHAIRMAN BRAY: I think the first order of business is to have presented at this time some of the resolutions that the committee has formulated for your consideration. I have appointed members of the Executive Committee to take care of the resolutions. So I will call upon them one at a time to give their resolutions and ask for your wishes in the case of each.

Charles Adams, will you give yours, please?

MR. ADAMS: "Be it resolved that we, the members of the Fifth Annual Reciprocal Meat Conference, do hereby extend our sincere appreciation to the National Live Stock and Meat Board for the following services:

"1. Assisting in the formulation of the program for 1952.

"2. Providing registration personnel, meeting room facilities, and conference materials.

"3. Furnishing secretarial service in order that our proceedings may be assembled and mimeographed for distribution.

"4. Providing room reservations at the Conrad Hilton Hotel and caring for other necessary conference details."

CHAIRMAN BRAY: Thank you. Is there any question regarding this resolution? Any amendment.

MR. BULL: I move that it be approved and copy transmitted to the National Live Stock and Meat Board.

(The motion was seconded.)

CHAIRMAN BRAY: The motion has been made and seconded that this resolution be approved and a copy of it be transmitted to the National Live Stock and Meat Board. Any questions? Any discussion?

MR. WANDERSTOCK: Do you want to include the dinner tonight as a special item, even though we haven't had it yet?

MR. ADAMS: I don't believe that has been included in past resolutions. It can be added if you wish.

CHAIRMAN BRAY: I would guess that is adequately covered in the way in which the resolution has been stated. All those in favor of the adoption of the resolution indicate by saying "aye"; opposed the same sign. The motion is carried.

Bill Cole, will you read your resolution, please?

MR. COLE: This is a resolution to the deans and heads of departments and will probably have a familiar ring from last year's because I thought it was a pretty good one.

"The membership of the Fifth Annual Reciprocal Meat Conference wish to express our sincere appreciation to our respective deans and department heads for making our attendance possible.

"This accumulation of knowledge to further our teaching, research and extension in our own institutions is of inestimable value, and we individually and collectively desire to convey our gratitude.

CHAIRMAN BRAY: Thank you. You have heard the resolution. What are your wishes?

MR. BULL: I move its adoption.

MR. WANDERSTOCK: Second.

CHAIRMAN BRAY: The motion is made and seconded that we adopt this resolution. Any discussion? If not, all those in favor indicate by saying "aye"; those opposed the same sign. The motion is carried.

Davey, will you read yours, please?

MR. MACKINTOSH: "Whereas, In the death of Professor E. J. Wilford, head of the Meats Section of the University of Kentucky, we of the Fifth Reciprocal Meat Conference have suffered the loss of a beloved associate and friend, and

"Whereas, Professor Wilford was a regular attendant at this Conference and took an active part in all of the sessions, and in his chosen field put the fullest measure of devotion into his daily tasks, and

"Whereas, In his passing, his institution has lost a faithful worker, whose energy was a potent factor in the classroom and throughout the state in a better understanding of meat problems; therefore be it

"RESOLVED, that we extend our deepest sympathy to the members of his family and to his associates at the University of Kentucky. His influence in our conferences will be sorely missed, but the inspiration of his life will ever inspire us to greater zeal in our work."

CHAIRMAN BRAY: You have heard this resolution. Will some one move its adoption?

MR. ADAMS: I so move.

MR. NAUMANN: Second.

CHAIRMAN BRAY: The motion has been made and seconded that we adopt this resolution. All those in favor indicate by saying "aye"; opposed the same sign. The motion is carried.

Lowell, you have a resolution.

MR. WALTERS: "Intercollegiate Meat Judging Contests, since their beginning, have received the generous support of a man who recognized early the merits of such contests. He has given generously of his time, his counsel, and facilities for the conduct of meat judging contests and grading clinics.

"The participants of the Fifth Annual Reciprocal Meat Conference are, indeed, appreciative of his support and by this resolution wish to express again their sincere appreciation to a real friend, Mr. Thomas E. Wilson and to Wilson and Company."

CHAIRMAN BRAY: You have heard this resolution. Will someone move its adoption?

MR. KUNKLE: I so move.

DR. PEARSON: Second.

CHAIRMAN BRAY: Motion has been made and seconded that we adopt this resolution. All those in favor indicate by saying "aye"; opposed the same sign. The motion is carried.

One more resolution, Tom Zeigler, please read your resolution.

MR. ZEIGLER: Those of us in attendance at the Fifth Reciprocal Meat Conference do, by this resolution, express our deep regret that Mr. Tomhave was unable to lead us in this annual meeting and desire to express our wish for his speedy recovery."

You have heard this resolution. Will someone move its adoption?

MR. WANDERSTOCK: I so move.

MR. HENRICKSON: Second.

CHAIRMAN BRAY: The motion is made and seconded that we adopt this resolution. All those in favor signify by saying "aye"; those opposed the same sign. The motion is carried.

MR. MACKINTOSH: Bob, before we disband, we have had the good fortune to have with us several whom we might describe as outside our group. While we did not think it possible to make a resolution, I should like to make a motion that our secretary be instructed to write a letter of thanks and appreciation to J. D. Gallery, D. H. Williams, J. E. Young, E. S. Clifton and R. G. Schott, for their valuable contributions to our conference.

MR. ADAMS: Second.

CHAIRMAN BRAY: I think that is an excellent idea and I am glad you thought of it, Davey. You have heard the motion. Is there discussion regarding it? All those in favor of the motion indicate by saying "aye"; opposed the same sign. The motion is carried.

MR. BUTLER: Mr. Chairman, I have this resolution for Mr. Bratzler.

CHAIRMAN BRAY: I am sorry, O. D., will you read it, please?

MR. BUTLER: I have written:

"Conspicuously missing this year due to illness is our first elected Chairman of the Reciprocal Meat Conference, L. J. Bratzler. He has made great contributions toward the institution, implementation, and perpetuation of this Conference.

"As our first Chairman he set a high standard of leadership, dependability and achievement for those who follow. His wisdom, diplomacy, and tact smoothed many rough spots on the road of progress. His absence has left a noticeable gap in our group.

"Be it resolved that the participants in this Reciprocal Meat Conference, acting individually and severally, send to him our greetings.

"Be it further resolved that we extend to him this gift of a record cabinet as a token of our esteem, along with a copy of this resolution signed by all members present.

"With this we convey our very best wishes and hopes for his complete and speedy recovery and return to our ranks."

CHAIRMAN BRAY: Thanks. You have heard this resolution. Will someone move its adoption?

MR. WANDERSTOCK: I so move.

MR. ADAMS: Second.

CHAIRMAN BRAY: The motion is made and seconded that we adopt this resolution. All those in favor indicate by saying "aye"; opposed the same sign. (Carried.)

(Announcements.)

CHAIRMAN BRAY: At this time I want to thank all of the chairmen for the excellent work they have done during the past year in getting this material rounded up that you have listened to for the past two days. Those of you who are on committees probably do realize the amount of correspondence and work that your chairmen have put in. I certainly want to express my appreciation to them at this time.

In addition I also want to thank the members of the Executive Committee for their help during the past year. As most of you probably know, it meant two or three trips to Chicago for them, where we sat down and talked about these things and then it meant considerable correspondence. These men have been very good in helping me to set up this program and I want to thank them at this time.

I have enjoyed acting as Chairman of the Program Committee and I hope that you have gotten as much from the conference as I have.

We have a new Executive Committee now, you know, and at this time I am going to turn the meeting over to the chairman of the new Executive Committee. I know that Bill Cole will do a grand job for you next year. So at this time I want to turn it over to Bill Cole.

(Mr. Cole assumed the Chair. Applause)

CHAIRMAN COLE: Thank you, Bob, and I don't think we need to go into this matter of democracy. If you are interested in the details, contact one of the members. I will assure you, it was purely and simply railroading.

I think first of all, we should pat Bob Bray on the back for the excellent job he has done. I think at this time it is fitting and proper that we show him what we think of his job the past year. (Applause)

I hope that next year's Conference, will be as successful.

I think that is the first point of business we want to bring up, that is, whether or not we should have a Sixth Reciprocal Meat Conference. I should like to entertain a motion to that effect.

MR. BUTLER: Mr. Chairman, I move that we have a Reciprocal Meat Conference again next year.

MR. PEARSON: Second.

CHAIRMAN COLE: The motion has been made and seconded that we have the Sixth Annual Reciprocal Meat Conference. Those in favor let it be known by saying "aye"; opposed. Carried unanimously.

I think, gentlemen, from these letters that I have here that Bob Bray passed over to me, which are mostly your recommendations, that we have sort of come -- I don't know whether it is to a turn in the road or a fork in the road, but we have come to the place where the next Reciprocal Meat Conference is probably due for some changes.

Briefly, most of the suggestions are hinting that we should do more in the way of research and research reporting. I think we should mention, however, in passing that a very good suggestion, I believe, has come from someone to the effect that the production men in our various departments should possibly be represented next year and present their ideas of what they think a meats man should do, what his job is.

I, for one, am highly in favor of doing service work. I think that is certainly in our line of duty. I think that we may not get our name on the paper, but I do think that service work to other projects is a very important job of a meats man. That was a suggestion for next year.

There are many other suggestions.

Incidentally, the Executive Committee has thought it wise that we retain the committees that we now have.

The Committees for the Sixth Conference are as follows:

COMMITTEES FOR SIXTH RECIPROCAL MEAT CONFERENCE

1953

EXTENSION COMMITTEE

1. Howard G. Ford, University of Arkansas, Little Rock, Arkansas, CHAIRMAN
2. Paul Brown, Louisiana State, Baton Rouge, Louisiana
3. James Christian, Pennsylvania State College, State College, Pennsylvania
4. J. B. Francioni, Jr., Louisiana State University, Baton Rouge, Louisiana
5. W. L. Richmond, Mississippi State College, State College, Mississippi
6. R. W. Snyder, Texas A. & M. College, College Station, Texas
7. K. F. Warner, U. S. D. A., Washington, D. C.
8. James Young, Purdue University, Lafayette, Indiana

MEAT JUDGING MANUAL AND CONTEST COMMITTEE

1. L. E. Walters, Oklahoma A. & M. College, Stillwater, Oklahoma, CHAIRMAN
2. O. D. Butler, Jr., Michigan State, East Lansing, Michigan
3. R. L. Hendrickson, University of Missouri, Columbia, Missouri
4. E. C. Stillwell, Ontario Agricultural College, Guelph, Ontario, Canada
5. K. F. Warner, U. S. D. A., Washington, D. C.
6. P. T. Ziegler, Pennsylvania State College, State College, Pennsylvania
7. Nathan Hale, University of Massachusetts, Amherst, Massachusetts
8. F. A. Beard, P. M. A. Livestock Branch, U. S. D. A., Washington, D. C.
9. Robert Kelly, University of Wisconsin, Madison, Wisconsin

RESEARCH REVIEW COMMITTEE

1. J. J. Wanderstock, School of Hotel Administration, Ithaca, New York, CHAIRMAN
2. T. N. Blumer, North Carolina State College, Raleigh, North Carolina
3. Wm. J. Loeffel, University of Nebraska, Lincoln, Nebraska
4. Thomas O. Meyer, State College of Washington, Pullman, Washington
5. Ellis A. Pierce, South Dakota State College, Brookings, South Dakota
6. R. E. Rust, Michigan State College, East Lansing, Michigan
7. L. N. Tucker, University of Missouri, Columbia, Missouri
8. M. M. Voegeli, Michigan State College, East Lansing, Michigan

RESEARCH METHODS COMMITTEE

1. Albert M. Pearson, University of Florida, Gainesville, Florida, CHAIRMAN
2. O. G. Hankins, B. A. I., U. S. D. A., Beltsville, Maryland
3. D. E. Brady, University of Missouri, Columbia, Missouri
4. R. W. Bray, University of Wisconsin, Madison, Wisconsin
5. F. E. Deatherage, Ohio State University, Columbus, Ohio
6. J. L. Hall, Kansas State College, Manhattan, Kansas
7. Joseph Kastelic, Iowa State College, Ames, Iowa
8. V. K. Johnson, West Virginia University, Morgantown, West Virginia
9. W. L. Sulzbacher, B. A. I., U. S. D. A., Beltsville, Maryland
10. R. L. Hendrickson, University of Missouri, Columbia, Missouri
11. B. C. Breidenstein, University of Illinois, Urbana, Illinois

LAMB CARCASS EVALUATION COMMITTEE

1. J. D. Kemp, University of Kentucky, Lexington, Kentucky, CHAIRMAN
2. G. W. Vander Noot, Rutgers University, New Brunswick, New Jersey
3. F. D. Carroll, University of California, Davis, California
4. J. H. Gallaway, Michigan State College, East Lansing, Michigan
5. E. P. Margerum, University of Wyoming, Laramie, Wyoming
6. A. W. Oliver, Oregon State College, Corvallis, Oregon
7. J. R. Stouffer, University of Illinois, Urbana, Illinois
8. Leonard Komm, University of Missouri, Columbia, Missouri
9. J. F. Kidwell, University of Nevada, Reno, Nevada

BEEF CARCASS EVALUATION COMMITTEE

1. E. D. Naumann, University of Missouri, Columbia, Missouri, CHAIRMAN
2. D. L. Mackintosh, Kansas State College, Manhattan, Kansas
3. Charles H. Adams, University of Nebraska, Lincoln, Nebraska
4. R. J. Deans, Michigan State College, East Lansing, Michigan
5. O. G. Hankins, B. A. I., U. S. D. A., Beltsville, Maryland
6. M. H. Hazaleus, Colorado A. & M. College, Fort Collins, Colorado
7. M. C. Heck, University of Arkansas, Fayetteville, Arkansas
8. Charles E. Murphey, Standardization & Grading Division, P.M.A., U.S.D.A., Washington, D. C.
9. G. H. Wellington, Cornell University, Ithaca, New York
10. Ernest Briskey, Ohio State University, Columbus, Ohio

PORK CARCASS EVALUATION COMMITTEE

1. Edwin A. Kline, Iowa State College, Ames, Iowa, CHAIRMAN
2. J. W. Cole, University of Tennessee, Knoxville, Tennessee
3. W. J. Aunan, University of Minnesota, St. Paul, Minnesota
4. L. J. Bratzler, Michigan State College, East Lansing, Michigan
5. R. L. Hiner, B. A. I., U. S. D. A., Beltsville, Maryland
6. M. H. Kerr, University of Maryland, College Park, Maryland
7. C. L. Strong, Standardization & Grading Division, P.M.A., U.S.D.A., Washington, D. C.
8. George Wilson, University of Wisconsin, Madison, Wisconsin
9. W. L. Brown, North Carolina State College, Raleigh, North Carolina
10. R. A. Merkel, University of Wisconsin, Madison, Wisconsin
11. Donald Kropf, University of Florida, Gainesville, Florida

TEACHING COMMITTEE

1. L. E. Kunkle, Ohio State University, Columbus, Ohio, CHAIRMAN
2. Vern Cahill, Ohio State, Columbus, Ohio
3. P. A. Anderson, University of Minnesota, St. Paul, Minnesota
4. Sleeter Bull, University of Illinois, Urbana, Illinois
5. R. A. Edger, Virginia Polytechnic Institute, Blacksburg, Virginia
6. E. D. Farwell, Michigan State College, East Lansing, Michigan
7. J. I. Miller, Cornell University, Ithaca, New York
8. Ralph P. Soule, Jr., Kansas State College, Manhattan, Kansas
9. Bernard Haasl, University of Wisconsin, Madison, Wisconsin

EXECUTIVE AND PROGRAM COMMITTEE

1. J. W. Cole, University of Tennessee, Knoxville, Tennessee, CHAIRMAN
2. R. W. Bray, University of Wisconsin, Madison, Wisconsin
3. C. H. Adams, University of Nebraska, Lincoln, Nebraska
4. National Live Stock and Meat Board, Secretary-Treasurer, Chicago, Illinois
5. D. L. Mackintosh, Kansas State College, Manhattan, Kansas
6. L. E. Walters, Oklahoma A. & M. College, Stillwater, Oklahoma

There are many other suggestions for our program next year, and we are going to expect and hope that you will send in more suggestions as time goes along.

One suggestion has been made and I personally am highly in favor of it. I would have liked to have seen a Warner-Bratzler shear demonstrated here in some way or another and show the limitations. I think there are other pieces of machinery that could very well be demonstrated at this meeting. I am sure that

8/7/80

9/1/89

25498

CHECKED
2008

VERIFIED
2013

C. F. T. R. I. LIBRARY, MYSORE.

Acc. No. 8442 F8, 3Za"p

Call No. ~~F85, 3Zap~~ J2 N52

Please return this publication on or before the last DUE DATE stamped below to avoid incurring overdue charges.

Due Date	Return Date	Due Date	Return Date	Due Date	Return Date
26.2.74	25/2/74				

p. 356

CFTRI-MYSORE
8442
5th annual recip..